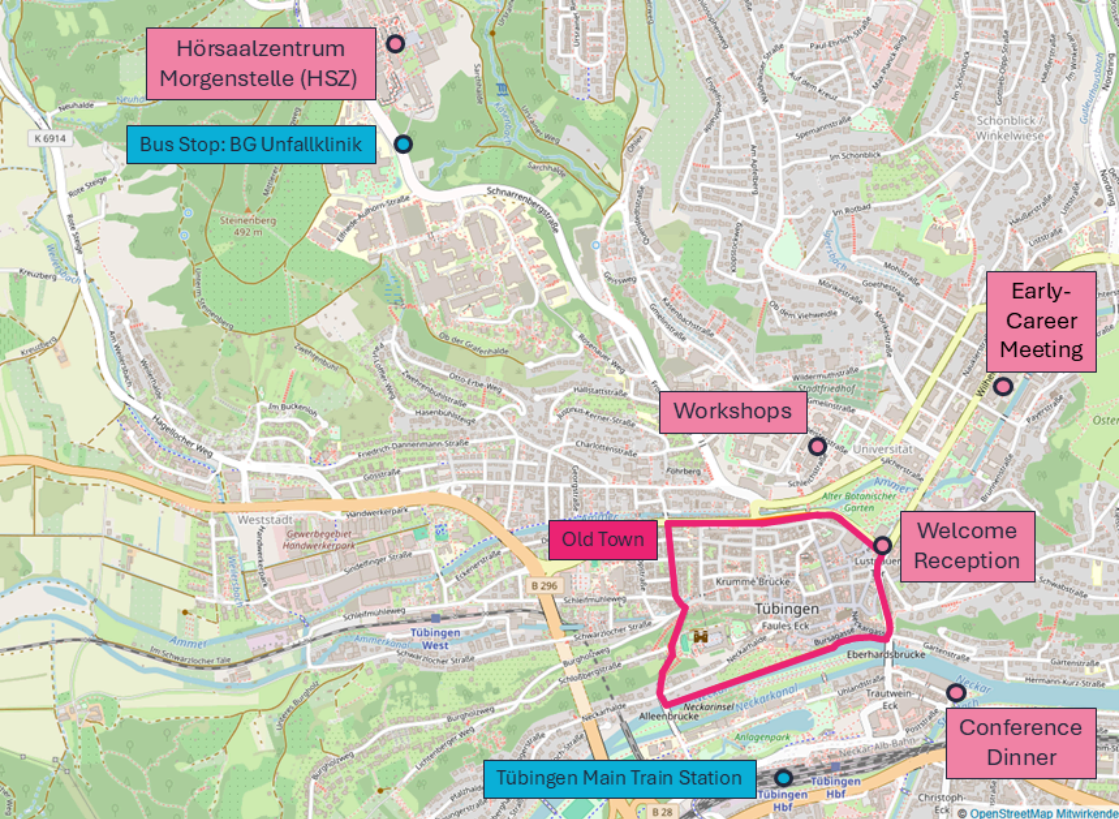


TUBINGEN TEAP 2026

March 15-18

Information & Book of Abstracts



Welcome!

Welcome to Teap 2026 in Tübingen.

We are pleased to have you with us and wish you a pleasant stay! If you have any questions, please do not hesitate to contact us. We are happy to help:

teap2026@psychologie.uni-tuebingen.de

Venue address:

Hörsaalzentrum Morgenstelle (HSZ)

Auf der Morgenstelle 16

72076 Tübingen

www.coms.app/teap26/



[@teap2026.bsky.social](https://teap2026.bsky.social)

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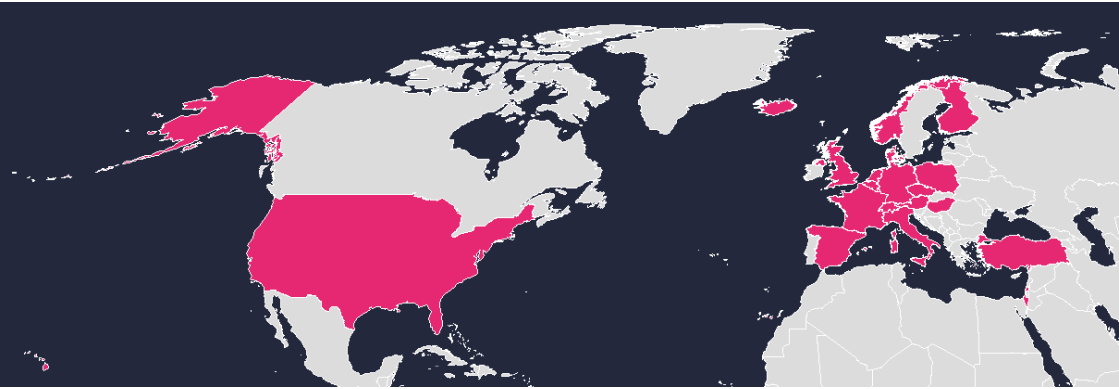
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Jennifer Schönfisch
Cindy Springmann
Hannah Stadler
Jule Thurner
Amely Wimmer
Helena Wolf
Emilia Wolter
Anabel Wysocki

Participants

Over 700 participants from many countries at TeaP 2026:



Austria
Belgium
Czech Republic
Denmark
Finland
France
Germany

Hungary
Iceland
Israel
Italy
Luxembourg
Malta
Netherlands

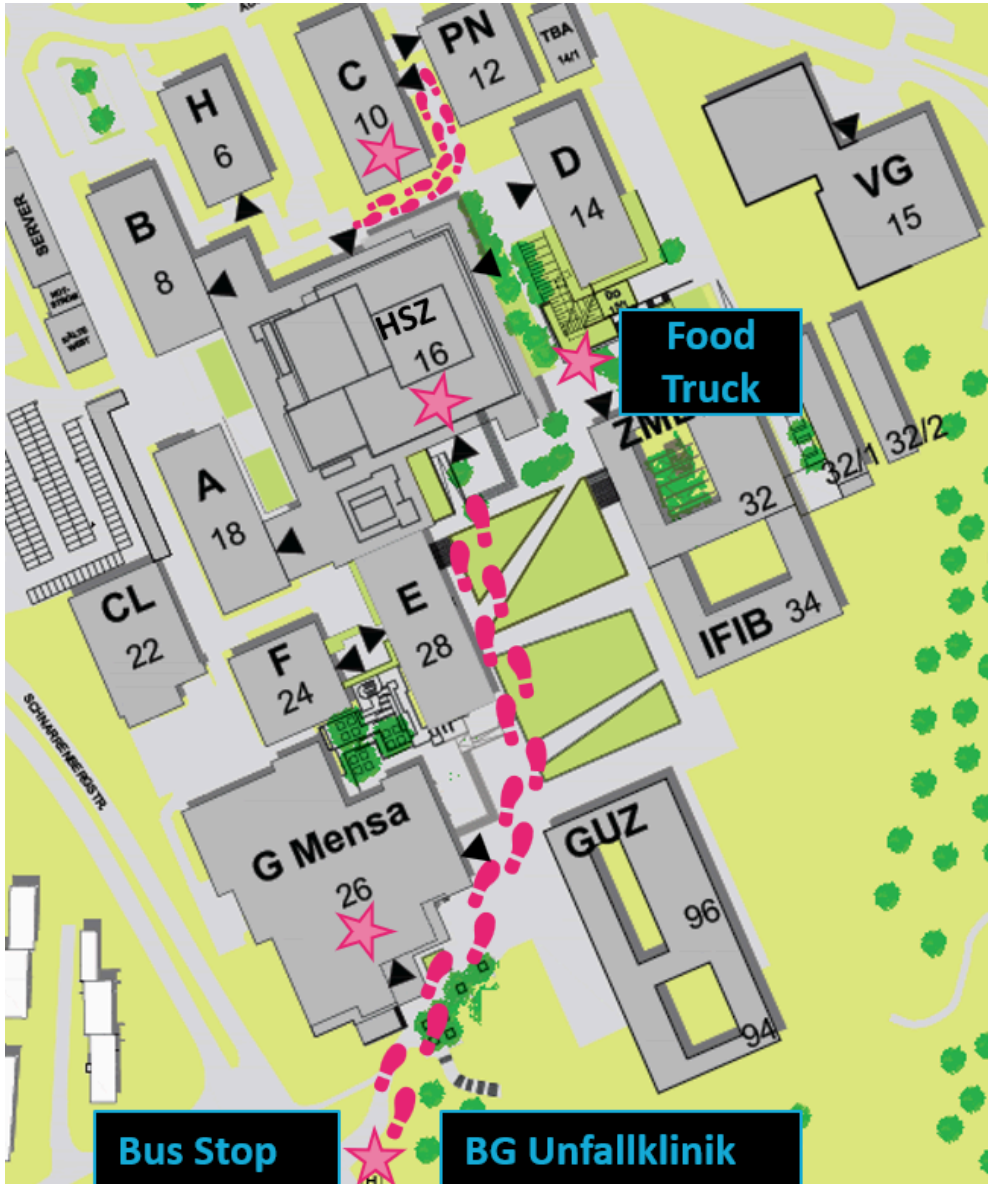
Norway
Poland
Spain
Switzerland
Türkiye
United Kingdom
United States

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Venue

Hörsaalzentrum (HSZ) Morgenstelle



Address: Hörsaalzentrum (HSZ) Morgenstelle, Auf der Morgenstelle 16

How to Get There: Bus Stop BG Unfallklinik (Bus Lines 5, 13, 18, 19)



WiFi: eduroam or UTguest (no password required)

Transportation within Tübingen

Tübingen is a compact and walkable city, making it easy to get around on foot. Most key locations - including the university buildings, city center, hotels, and train station - are within walking distance or easily reachable by local bus.

The city's public transportation system is reliable and well-connected. Buses run frequently throughout the day, including routes to the Morgenstelle campus (Stop: **BG Unfallklinik**), where many university facilities are located.

Up-to-date schedules and route information are available at:

www.naldo.de (in German)

Your conference registration includes a free bus ticket for Tübingen city transport during the conference days March 15-18. It is valid for all bus and train lines within the city of Tübingen. You can pick up your ticket at the conference desk.

Additionally, for local transportation outside Tübingen, you can buy tickets at machines, via mobile apps, or directly on the bus (card payment may not be available on all buses, so having small change is recommended).



For short distances, biking is also a great option: Tübingen is bike-friendly, with dedicated lanes and scenic paths along the Neckar River. You can rent a bike in Tübingen:

www.tuebingen.de/radfahren/31482.html

Lunch Options

Campus Morgenstelle

Mensa: The University Mensa at Morgenstelle is the main dining option and is conveniently located right at the conference venue. At lunchtime, the Mensa offers a wide selection of hot daily dishes, salads, and desserts. For external guests, meal prices usually range between 5€ and 8€. This makes the Mensa the go-to spot for most attendees looking for a full lunch. Cash is not accepted; please use your EC or credit card.

Cafeteria: For those looking for a lighter option, there is also a cafeteria located on the ground floor of the Mensa building. It offers a variety of hot and cold drinks, sandwiches, snacks, and sweets. Cash is not accepted; please use your EC or credit card.

Foodtruck: For TeaP 2026, we also arranged foodtrucks: Wok dishes on Monday, Maultaschen on Tuesday, and pasta dishes on Wednesday. There is something new to try on each day, and you can customize your meal. Each portion is 12€ and there are outside or inside options for you to sit and enjoy.

City center

Old town: If you feel like exploring a bit more in your free time, Tübingen's old town offers a wide range of restaurants, cafés, and bakeries. It takes 10 minutes by bus to get there from Morgenstelle. Cards may not be accepted at all times; please carry cash.

Pre-conference workshops: For Sunday, March 15, light lunch packages will be provided at the pre-conference workshop venue (Schleichstraße 4) for participants who have registered for both morning (till 12:30) and afternoon (from 13:30) sessions. For all others, there are many options in the old town, which is only a 5-minute walk away.

Accessibility and Family Support

We want all participants to feel welcome and supported throughout the event. If you have any needs, please feel free to contact the organizing team in advance or approach us on site at any time. We will do our best to arrange suitable solutions (e.g., step-free access, reserved seating, hearing support such as induction-loop compatibility, or other individual solutions).

Accessibility

The Hörsaalzentrum Morgenstelle is wheelchair-accessible and includes step-free entrances and accessible restrooms. If you would like specific route guidance (e.g., step-free paths, entrances to particular lecture halls, or reserved seating), please contact the organizing team. We will gladly assist.

Silent Room

A designated Silent Room (room 8D09 in the basement of the Hörsaalzentrum) will be available during the event (from Monday to Wednesday) as a no-talking space for resting and recharging between sessions. The room is intentionally kept minimal, with reduced lighting, and offers comfortable seating so you can sit down and decompress. Earplugs and light-blocking masks, as well as three weighted blankets will be provided in the room. Please help us keep this area calm and silent: no conversations or phone calls. All technical devices must be set to silent mode.

Family-Friendly Facilities

For participants attending with children, the Hörsaalzentrum Morgenstelle offers family support infrastructure. A family room (Familienzimmer, room 3E06) is available for breastfeeding, diaper changing, and short breaks. It is equipped with a kitchenette (including a microwave), table seating, sofa, toys, and a changing table. The family room will be managed by a student assistant at the conference desk. If you would like to use the room, please contact the conference desk and our staff can unlock it for you, provide access as needed, and ensure the room is kept tidy during the day.

Playgrounds

In Tübingen, families can find many leisure opportunities. With around 90 playgrounds across the city and its districts, there is plenty of space to play, climb, and let off steam. Open family meetups and neighborhood community centers offer opportunities to get to know others and exchange ideas.

For families attending the event, there are several opportunities for outdoor breaks in the vicinity of Campus Morgenstelle. Nearby options include play and activity areas in the Waldhäuser-Ost (WHO) district, such as the playground “Bei den Römergräbern” (Bei den Römergräbern 14) and the outdoor activity area Holderfeld (Waldhäuser Straße 148).

For additional playground locations across Tübingen, please consult the City of Tübingen’s public playground overview:

www.tuebingen.de/stadtplan/#spielplaetze_neu

Information about Tübingen

Tübingen is a charming university city rich in history, culture, and scenic beauty. Whether you're into history, nature, or just wandering through picturesque alleys, Tübingen has something to offer for everyone. For general information about the city, please visit the official website: www.tuebingen.de



Punting on the Neckar (Stocherkahnfahrt): A uniquely Tübingen experience. Glide along the river in a traditional flat-bottomed boat, guided by students or locals, especially scenic in summer or early autumn. In March, please contact www.stocherkahn-viaverde.de/

Hohentübingen Castle: This 11th-century castle is just a short uphill walk from the old town. It houses parts of the University's museum, including archaeological and scientific collections – and offers spectacular views over Tübingen and the Neckar valley.



Altstadt (old town): Lose yourself in winding alleys, lined with colorful half-timbered buildings, small boutiques, cafés, and bakeries. The Marktplatz is the heart of the old town, with its Renaissance town hall and occasional local markets.



Museums and art: Visit the Museum of Ancient Cultures in the castle, or explore contemporary art at the Kunsthalle Tübingen, which often features international exhibitions.

Stiftskirche (Collegiate Church):

A beautiful Gothic church in the town center, historically linked to the university. Climb the tower for a panoramic view of the old town rooftops.



Cafés and Bakeries: Tübingen is full of cozy spots for coffee and cake. Many bakeries offer traditional Swabian specialties.

New Botanical Garden: Located near Campus Morgenstelle, the Botanical Garden is perfect for a quiet walk or a lunch break outdoors. It features over 10,000 species of plants and themed areas from alpine flora to tropical greenhouses.

Other: Stadtmuseum, Neues Kunstmuseum, Old Botanical Garden, Wurmlinger Kapelle (outside Tübingen)

For further tips on sightseeing, events, and guided tours, check the Tübingen Tourist Center: www.tuebingen-info.de

If you're looking for insights from locals and visitors alike, the community-driven TUEpedia offers a unique perspective on what to explore: www.tuepedia.de/wiki/Portal:Tourismus

University of Tübingen



The University of Tübingen is one of Europe's oldest and most prestigious universities, founded in 1477 and internationally recognized for its research-driven and interdisciplinary approach to education. With a strong global network and over 200 academic programs, the university is a leader in fields such as neuroscience, artificial intelligence, medicine, philosophy, environmental studies, and cultural sciences. It is part of the German government's Excellence Strategy and home to several collaborative research centers and clusters. The university's historic buildings, modern facilities, and close integration into the city make Tübingen a vibrant and inspiring place to study and work. The mix of academic tradition and innovation creates a unique atmosphere, ideal for intellectual exchange and international collaboration. To learn more about the University of Tübingen, visit its official website: www.uni-tuebingen.de/en.

TeaP 2026 was kindly supported by



Deutsche
Forschungsgemeinschaft
German Research Foundation

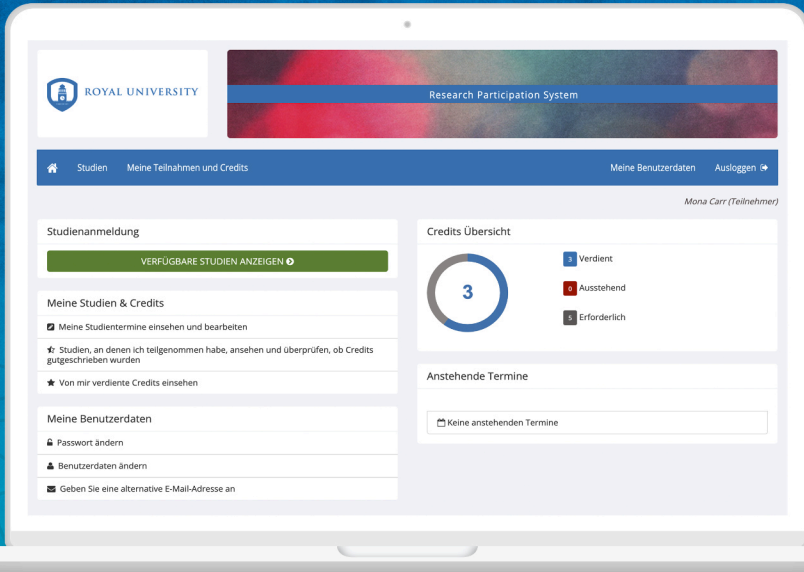
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Program & Abstracts

Keynotes

Pre-Conference Workshops

Special & Social Events

Symposia

Mixed-Topic Sessions

Poster

Program

Monday, 16 March										
09:00-10:30	Working Memory in Childhood	Human-AI Interaction	Role of Events & Boundaries	Comp. Models of Confidence 1	Binding & Learning	Illusions → Vision	Advice Taking 1	Negation Processing 1	Narrative Architecture	Beliefs → Metacognition
10:30-11:00	Coffee Break									
11:00-12:30	Exp. Engineering & Hum. Factors	AI & Robots	Simon Goes Social	Comp. Models of Confidence 2	Perception & Psychophysics	Vision → Memory	Advice Taking 2	Negation Processing 2	Cognitive Aging	Metacognition → Action
12:30-13:30	Lunch Break at Foodtrucks or Mensa Morgenstelle									
13:30-15:00	Welcome and Keynote: Asifa Majid in N6									
15:00-16:30	Poster Session 1 + Coffee Break									
16:30-18:00	Memory Research	Attributing Minds to Machines	Symbolic Representations	Metacognition Recent Insights	Illusions & Perception	Memory → Arithmetics	Human Social Perception	Semantic Social Language	Number Semantics	Action → Attention
18:30-19:30	Treffen der DGPs-Fachgruppe Allgemeine Psychologie in N1									
09:00-10:30	Task Switching & Dual Tasking	Human-AI Dynamics	Affective Information	Diffusion Models 1	Source Memory 1	Text → Language	Poster Awards Session	Adaptive Lang. Mechanisms	Theory of Visual Attention 1	Attention → Cog. Control
10:30-11:00	Coffee Break									
11:00-12:30	Cognitive Flexibility	Language Models as Tools	Categorization	Diffusion Models 2	Source Memory 2	Language → Communication	Emp. Aesthetics: Beauty	Word Learning	Theory of Visual Attention 2	Cog. Control → Motor Control
12:30-14:00	Lunch Break at Foodtrucks or Mensa Morgenstelle / Career Paths Beyond University in N3									
14:00-15:00	Keynote: Hanna Schliehauß in N6									
15:00-16:30	Poster Session 2 + Coffee Break									
16:30-18:00	Error Processing	Comp. Lang. Models	Grounding Rules in Regularities	Emotional Sem. Mapping	Prospective Memory	Early-Career Talks	Emp. Aesthetics: Liking	Bilingual Lang. Control	Visual Foraging Flexibility	Motor Control → Basketball
18:30-00:00	Conference Dinner at Neckawa									
Tuesday, 17 March										
09:00-10:30	Distributed Cognition	Evaluative Conditioning	Ling. & Non-Cognition 1	Word Recognition	Instruction in Learning	Communication → Interaction	Short-Term Memory	Traffic & Transport	Recognition → Aging	Time Percep. → Decision Making
10:30-11:00	Coffee Break									
11:00-12:30	Oculomotor Research	Contexts in Decision Making	Ling. & Non-Cognition 2	Communication Strategies	Embodied Cognition	Interaction → Technology	Emotion → Memory	Traffic → Climate	Curiosity → Self-Efficacy	Decision Making → Modeling
12:30-13:30	Lunch Break at Foodtrucks or Mensa Morgenstelle									
13:30-15:00	Poster Awards, Networking Challenge Prize Draw & Keynote: Cathleen Moore in N6									
15:00-16:30	Poster Session 3 + Coffee Break									
16:30-17:00	Closing Remarks									
17:30-19:00	Guided City Tours									
Wednesday, 18 March										

Keynotes

Keynotes

Asifa Majid

Department of Experimental Psychology,
University of Oxford, UK

Title: Cognition in Cultural Context:
Discovering Universals among
Diversity

When: Monday, March 16, 14:00-15:00

Where: N6, HSZ Morgenstelle



Over the last years, there has been increasing interest in the remarkable diversity humans exhibit across cultures, languages, and environments. At the same time, cognitive science continues its search for universal principles of mind. In this keynote, I demonstrate how universals are best discovered by engaging directly with cultural variation rather than treating it as peripheral. Drawing on cross-linguistic and cross-cultural research, I show how studying diverse populations can reveal constraints placed on human cognition, as well as identifying possibilities that are limited by our overly narrow sampling strategies. By integrating insights across fields, this work demonstrates how and when cognitive and perceptual systems are shaped by cultural context while still adhering to shared foundations.

Asifa Majid's research focuses on the relationship between culture, language, and cognition. Through studies with adults and children across different cultures and sub-cultures, she investigates which aspects of cognition are universal and which are specific to particular languages or cultures. Asifa Majid is a Fellow of the British Academy and the recipient of the Jeffrey L. Elman Prize for Scientific Achievement and Community Building in 2024, awarded by the Cognitive Science Society. Moreover, she is the President of the Experimental Psychology Society from 2026 on.

Keynotes

Hanna Schleihauß

Department of Developmental Psychology,
Utrecht University, the Netherlands

Title: The Development and Evolution
of Rationality

When: Tuesday, March 17, 14:00-15:00

Where: N6, HSZ Morgenstelle



A rational agent responds to evidence and reasons, follows the strongest available evidence, and is willing to revise prior beliefs when confronted with compelling counterevidence. In this talk, I explore the ontogenetic and phylogenetic roots of such rational capacities. I will begin by presenting a series of studies tracing the origins of one of the hallmarks of rationality: the selective revision of beliefs in light of new evidence. These findings reveal that this key component of rationality emerges early in life and is shared with our closest evolutionary relatives, the chimpanzees, suggesting that the foundations of rationality are deeply rooted in our evolutionary history. I will then turn to what may be a uniquely human dimension of rationality: its profoundly social nature. Humans do not merely reason individually; we reason together. I will present work demonstrating both the benefits of joint reasoning as well as its vulnerabilities. While reasoning with others allows us to settle conflicts peacefully, it can also introduce biases driven by social alignment, conformity, and the desire for belonging. Together, these studies highlight a central tension at the heart of human rationality: it is simultaneously a truth-seeking and a social system.

Hanna Schleihauß investigates the development and evolution of rational decision-making processes as well as the socio-cognitive underpinnings of cultural learning. She conducts research not only across cultures – working with participants from Kenya, China, the Netherlands, Germany, and the USA – but also across species, studying both humans and chimpanzees.

Keynotes

Cathleen Moore

Department of Psychological and Brain Sciences, University of Iowa, USA

Title: Exploring the fundamental role of object structure in perception and action

When: Wednesday, March 18, 14:00-15:00

Where: N6, HSZ Morgenstelle



Demonstrations of perceptual organization processes like grouping, surface completion, figure-ground assignment, and correspondence across time and space, are fascinating not just because of their compelling phenomenology, but because they provide insight into different levels of representation and their functions within the visual cognitive system more generally. I will present research that has focused on some of the functional consequences of perceptual organization in visual processing as it unfolds over time. An implication of this work is that perceptual organization processes serve to establish dynamic representations of the current object structure of the world, which in turn determines how newly sampled visual information is integrated into existing representations of the external world. I will argue that this function of perceptual organization is a critical determinant of what we see and how we act on it.

Cathleen Moore's research focuses on visual perception and attention, particularly on how the visual system organizes incoming information (perceptual organization) and how this influences other aspects of visual processing. Cathleen Moore has received numerous awards, including being named a Fellow of the Society of Experimental Psychologists, the Association for Psychological Science, and the Psychonomic Society.

Pre- Conference Workshops

Pre-Conference Workshops

Demystifying Preprints

Who?	Assoc. Prof. Dr. Krzysztof Cipora (Jagiellonian University, Krakow, Poland)
When?	Sunday, March 15, 2026, 10:00-12:30
Where?	Department of Psychology / IWM, Room 4.328
Requirements	Having a laptop with an internet connection can be useful to explore the resources Krzysztof will be talking about.

One of the fundamental elements of scientific work is sharing knowledge. To ensure the accumulation of knowledge, it is important for new findings to be swiftly communicated to other researchers. This idea formed the foundation for establishing scientific journals. At the same time, in parallel to journal publications, scientists have traditionally shared their manuscripts (or preprints) with their colleagues for centuries via traditional mail. At the end of the 20th century, the process of preprint sharing has reached a new level with the development of the Internet and was spearheaded by researchers in theoretical high-energy physics. Other disciplines soon followed the suit, including psychology. Nevertheless, there are still several questions and uncertainties around preprint sharing, with both enthusiasts and sceptics expressing their views. In this workshop, we will cover the history of preprints, their positives and negatives, as well as possibilities for integrating preprint sharing into the scientific workflow. We will explore tools for preprint sharing as well. At the end of the workshop, the participants will gain (a) the knowledge necessary to decide whether preprint sharing is suitable for them and to justify their point of view to collaborators and colleagues, and (b) the skills necessary to start sharing preprints.

Pre-Conference Workshops

Scientific Storytelling: From Data to Narrative

Who?	Dr. Georg Hafner
When?	Sunday, March 15, 2026, 10:00-12:30
Where?	Department of Psychology / IWM, Room 6.333
Requirements	Participants should prepare an abstract of their ongoing research project in advance.

This workshop looks at scientific concepts through the lens of storytelling. Storytelling is a powerful tool for conveying complex ideas clearly and effectively, making it ideal for science communication. By learning core storytelling principles, participants will gain a fresh perspective on their research. Framing a study as a story helps guide audiences more intuitively through experiments and findings. Moreover, a narrative cannot be constructed when creating a presentation or writing a paper but has to start already with the purposeful design of experiments. Therefore, thinking in the framework of a story helps in refining an experimental agenda and ultimately in becoming a better scientist.

Through a mix of interactive exercises, individual tasks, and group discussions, participants will learn key storytelling components and how to apply them in a scientific context. Building on the central message of their own research story, they will craft a compelling narrative around their project. Because these techniques are applied directly to participants' current work, they leave the workshop with concrete ideas they can immediately integrate into their ongoing research.

Pre-Conference Workshops

Introduction to Eye Tracking with Tobii – Screen-Based Eye Tracking

Who?	Dr. Nenad Jovanovic (Tobii AB), Michael Schoenes (Tobii AB)
When?	Sunday, March 15, 2026, 10:00 to 12:30
Where?	Department of Psychology / IWM, Room 4.332
Requirements	Participants are encouraged to bring a laptop with the free trial version of Tobii Pro Lab installed; however, this is not mandatory.

This workshop is designed for researchers who are new to eye tracking or who are considering eye tracking as a research methodology. This morning session introduces the fundamentals of eye tracking and demonstrates screen-based eye-tracking devices commonly used in psychology, developmental psychology, sociology, linguistics, and related disciplines.

We will cover calibration procedures, basic study design and setup, data collection, data visualization, and an introduction to basic data analysis using Tobii Pro Lab. The session combines short explanations with demonstrations, and there will be time for questions throughout.

If you would like to explore eye tracking beyond the screen and learn how to run studies in real-world environments, you are also welcome to sign up for our afternoon session on mobile eye tracking with glasses.

Pre-Conference Workshops

Demystifying Academic Publishing: Insights from the Experts

Who?	Dr. Amy Strivens (University of Tübingen)
When?	Sunday, March 15, 2026, 13:30 to 16:30
Where?	Department of Psychology / IWM, Room 6.334
Requirements	None

Publishing research is a cornerstone of academic life - essential for securing grants, advancing careers, and completing degrees. Yet, while researchers receive extensive training in writing manuscripts, the submission and publication process often remains complex and opaque. This workshop is designed for early career researchers with limited experience in publishing. We will provide a clear, step-by-step overview of the entire process, including:

- Selecting the right journal for your work
- Crafting an effective cover letter
- Navigating peer review and responding to reviewers
- Understanding editorial decision-making criteria

Following the introduction, an expert panel of three journal editors and experienced scholars will share their insights and answer your questions in an interactive Q&A session (please note that Prof. Dr. Andrea Kiesel and Prof. Dr. Christian Frings had to cancel at short notice):

- Assoc. Prof. Dr. Senne Braem
- Prof. Dr. Carina G. Giesen
- Dr. Anne Voormann

Whether you're preparing your first submission, responding to reviewer feedback, or simply curious about what happens behind the scenes, this workshop will equip you with practical strategies and insider perspectives to help you succeed.

Pre-Conference Workshops

Gentle Introduction to Bayesian Statistics and Contrast to Frequentist Statistics

Who?	Dr. Sascha Meyen (University of Tübingen)
When?	Sunday, March 15, 2026, 13:30 to 16:30
Where?	Department of Psychology / IWM, Room 6.333
Requirements	Laptop with statistical software R installed. Optional: Your own data set to apply Bayesian analyses on

Bayesian statistics are a tool that psychological researchers are often required to use. This workshop is a starting point for understanding the basics. We will cover Bayes Factors using Rouder & Morey's default Cauchy priors, Kruschke's Credibility Intervals, and how to model your own prior distributions. For these analyses, we will understand how they work conceptually, how to implement them in R, and how to apply them in practice. As for Frequentist statistics, Bayesian statistics can be misused, leading to problems. We discuss the common pitfalls and how to interpret Bayesian results correctly. I will contrast the two schools of statistics to help you understand each side's advantages and disadvantages.

If you are looking for a gentle introduction to how Bayesian analyses work in the standard cases, you are warmly welcome. Please bring your own laptop with the statistical software R (r-project.org/) installed and, optionally, a data set from your own research to apply the methods to. We will not discuss more complex Bayesian analyses, such as hierarchical or mixed models. This workshop may be boring for you if you are already at the stage where you can learn about these analyses.

Pre-Conference Workshops

Introduction to Eye Tracking with Tobii – Mobile Eye Tracking (with Glasses)

Who?	Dr. Nenad Jovanovic (Tobii AB), Michael Schoenes (Tobii AB)
When?	Sunday, March 15, 2026, 13:30 to 16:30
Where?	Department of Psychology / IWM, Room 4.332
Requirements	Participants are encouraged to bring a laptop with the free trial version of Tobii Pro Lab installed (optional)

This workshop is designed for researchers who are new to eye tracking or who want to understand how eye tracking can be used in applied, real-world tasks. This afternoon session focuses on eye tracking using mobile eye-tracking glasses, an approach widely used in areas such as industrial and organizational psychology, sports science, movement research, market research, and other applied fields.

Participants will get an overview of typical study workflows with eye-tracking glasses and will be able to test and use the devices. We will discuss practical aspects of study setup and data collection, and show how to review recordings and work with data in Tobii Pro Lab. Time is reserved for questions and discussion related to participants' own research ideas.

If you are also interested in learning the fundamentals of eye tracking and how to run controlled studies with screen-based systems, consider signing up for our morning session as well.

Pre-Conference Workshops

Shining Light on the Brain: A Hands-On Introduction to fNIRS (Hyperscanning) for Experimental Psychology with Artinis and NIRx

Who?	Franziska Keller, M.Sc. (NIRx Medizintechnik GmbH), Katharina Stute, M.Sc. (Artinis Medical Systems)
When?	Sunday, March 15, 2026, BOTH Parts 1 and 2 (10:30 to 12:30 and 13:30 to 16:30), or ONLY Part 2 (13:30 to 16:30)
Where?	Department of Psychology / IWM, Room 4.326
Requirements	Laptop recommended. No programming experience required. Optional: bring a short description of your research question / paradigm for discussion

Are you looking to take your research to the next level and add a powerful brain-imaging method to your experimental toolbox without needing a scanner or complex infrastructure? In this interactive workshop, you will get a practical introduction to functional Near-Infrared Spectroscopy (fNIRS): a non-invasive neuroimaging technique that measures task-related changes in cortical oxygenation. fNIRS is uniquely suited for many areas of experimental psychology, including cognitive control, attention, language, social interaction, development, and real-world behavior - especially in settings where other modalities may be limiting. Part 1 of the workshop (10:30 to 12:30) will provide an overview of the basic principles of fNIRS, what it measures (and what it does not), and how it can be applied in different experimental settings and applications. Participants will learn how to avoid common pitfalls and how to think critically about experimental and montage design, as well as data quality. Part 2 of the workshop (13:30 to 16:30) will be hands-on and interactive: we will run live fNIRS recordings, including whole-head imaging and hyperscanning setups, with volunteers from the audience and discuss both the NIRSport2 and Brite platforms and how they complement each other. We will also present basic data analysis concepts and introduce our data analysis software, Satori. The goal is for you to leave with a concrete understanding of whether - and how - fNIRS could meaningfully support your research questions. For more experienced fNIRS users, we recommend joining Part 2 of the workshop (13:30 to 16:30).

Pre-Conference Workshops

LLMs vs. Human Language Processing

Who?	Prof. Dr. Fritz Günther (HU Berlin), Dr. Francesca Capuano (University of Tübingen)
When?	Sunday, March 15, 2026, 10:00 to 16:30
Where?	Department of Psychology / IWM, Room 4.333
Requirements	Participants should bring a laptop. Basic programming knowledge is beneficial but not required.

This workshop explores whether Large Language Models (LLMs) can serve as useful tools for research in psycholinguistics. We will begin with a brief introduction to LLMs, covering their architecture and the basic principles behind how they learn and generate language. Building on this foundation, we will explore how LLMs are currently probed to study human language processing. The workshop focuses on three central approaches. Surprisal quantifies how unexpected a word is in context and mirrors cognitive effort in human comprehension, helping simulate how humans process surprising or ambiguous language. Prompting allows researchers to design targeted linguistic inputs, making it possible to probe model behavior under controlled conditions that parallel psycholinguistic experiments, allowing participants to simulate studies on sentence processing, ambiguity resolution, or word prediction. Internal representations, such as embeddings, offer insights into how LLMs encode syntactic and semantic relationships, paralleling representational levels in the human language system. Participants will have hands-on opportunities to experiment with these techniques, analyze model outputs, and discuss the implications of their findings. The workshop concludes with a critical discussion of the limitations and challenges of using LLMs for psycholinguistic research, including issues of interpretability, bias, and the extent to which model behavior can be meaningfully compared to human cognition.

Pre-Conference Workshops

Open-source EEG/ERP Analysis Using the Julia Language

Who?	Dr. Carolin Dudschig (University of Tübingen), Dr. Ian Mackenzie (University of Tübingen), Samuel Sonntag, M.Sc. (University of Tübingen)
When ?	Sunday, March 15, 2026, 10:00 to 16:30
Where?	Department of Psychology / IWM, Room 4.327
Requirements	Bring own laptop. No background knowledge required. This course is intended for beginners in EEG / ERP analysis.

This pre-conference workshop offers an introductory, hands-on overview of EEG/ERP analysis using the Julia programming language. The course is aimed at beginners — both in EEG/ERP methods and in programming. Participants will learn the fundamentals of preprocessing and analyzing EEG and ERP data, with practical exercises conducted directly in Julia. Key topics include importing and visualizing EEG/ERP data, applying basic preprocessing techniques (e.g., filtering and artifact removal), and performing simple statistical analyses. No prior experience with Julia or EEG/ERP analysis is required. By the end of the session, participants will be equipped with the foundational skills needed to begin exploring EEG/ERP analysis independently using Julia.

Session 1 (morning):

- Introduction to EEG and ERP analysis steps
- Introduction to the Julia programming language

Session 2 (afternoon):

- Hands-on EEG/ERP analysis

Pre-Conference Workshops

Why Do We Need Power? Gaining Insights from Simulation Studies

Who?	Dr. Florian Wickelmaier (University of Tübingen), Dr. Nora Wickelmaier (IWM Tübingen)
When?	Sunday, March 15, 2026, 10:00 to 16:30
Where?	Department of Psychology / IWM, Tüdilab
Requirements	See workshop website: www.mathpsy.uni-tuebingen.de/wickelmaier/2026-teap/

Help, my effect size is too large! Rarely would anyone express a complaint like that. And yet, unrealistically large effect estimates are a widespread artifact resulting from a combination of low power and selection by significance. Conversely, high power is a necessary condition for valid inference. In this workshop, we will illustrate with real-world examples the failures when drawing conclusions from underpowered studies. We will introduce how to calculate the power of a statistical test by computer simulation. In order to gain hands-on experience with implementing these simulations in software, participants should bring their own laptops with R installed.

Content:

- Power and the significance filter
- Simulation-based power analysis with R
- Drawing power curves
- Power for t-tests, ANOVA, ANCOVA, and mixed-effects models

Special & Social Events

Special & Social Events

Öffentlicher Vortrag: Sprachliche und Nicht-Sprachliche Kognition (in German)

When? Sunday, March 15, from 5 to 6 p.m.

Where? Beletage Museum (Wilhelmstraße 3): Uhlandsaal

Der Fachbereich Psychologie der Universität Tübingen lädt zu einem öffentlichen Vortrag ein. Mit dabei: SPIEGEL-Bestsellerautor Dr. Jens Foell. Alle Interessierten sind herzlich willkommen!

Im Anschluss an den öffentlichen Vortrag findet in denselben Räumlichkeiten die Welcome Reception statt, inklusive Speed Mentoring for Early Career Researchers.

Special & Social Events

Welcome Reception

When? Sunday, March 15, from 6 to 9 p.m.

Where? Beletage Museum (Wilhelmstraße 3): Silchersaal

Following the public lecture ("Öffentlicher Vortrag"), all participants are invited to the traditional Welcome Reception.

You will have the opportunity to pick up your conference bag, meet old and new colleagues, and have a drink at the bar. Later on, you can have dinner downstairs in the 1821 restaurant or in any of the many other restaurants located in Tübingen's old town close to the Beletage Museum.

Early career researchers are warmly invited to join the gathering at Saints & Scholars, just a 5-minute walk away.

Special & Social Events

Speed Mentoring for Early Career Researchers

When?	Sunday, March 15, from 7 to 8 p.m.
Where?	Beletage Museum (Wilhelmstraße 3): Brahmszimmer

Early career researchers (ECRs) have the opportunity to participate in a speed mentoring session with established mentors in the field of Cognitive Psychology. ECRs will have the opportunity to discuss two career-related issues with mentors in short 10-minute sessions. There will then be time for open discussion and feedback on the mentoring program. ECRs interested in a mentoring relationship are welcome, as well as ECRs already in the mentoring program. The aim of the meeting is to strengthen and expand the network of ECRs, to disseminate information about the program, and to exchange ideas between mentees and mentors on how to improve the program.

ECRs who are interested in Speed Mentoring can register to participate via the Cognitive Psychology Section of the DGPs. The deadline for registration is the 1st of March. All other ECRs, mentees, and mentors are welcome for an open and informal exchange!

Organized by the Cognitive Psychology Section of the DGPs.

Special & Social Events

Meeting of Early-Career Researchers

When? Sunday, March 15, starting from 7 p.m.

Where? Saints & Scholars (Wilhelmstraße 44)

www.saints-and-scholars.de

All graduate students, post-docs, and assistant professors are invited to join the meeting of early-career researchers for a get-together, discussion, and informal exchange. This year, we will meet in the evening after the welcome reception at "Saints & Scholars". No registration is required.



Organized by the Cognitive Psychology Section of the DGPs.

Special & Social Events

Treffen der DGPs-Fachgruppe Allgemeine Psychologie (in German)

When? Monday, March 16, from 6:30 to 7:30 p.m.

Where? Hörsaalzentrum Morgenstelle: Lecture Hall N1

Die Fachgruppe Allgemeine Psychologie lädt zum jährlichen (hybriden) Fachgruppentreffen ein. Die Tagesordnung wurde hierzu bereits vorab versandt.

Snacks und alkoholfreie Getränke werden bereitgestellt. Keine Anmeldung ist nötig.

Special & Social Events

Career Paths Beyond University (mainly in German)

When? Tuesday, March 17, from 1 to 2 p.m.

Where? Hörsaalzentrum Morgenstelle: Lecture Hall N3

Pursuing a Ph.D. or post-doc in cognitive psychology, we observe many different possibilities for staying in academia. However, it often seems less obvious where cognitive psychologists are needed and employed beyond academia. For this lunch session, we invited cognitive psychologists who left academia and now work in very different fields. They will give you insights about their motivation to leave academia, about what they are doing now, and, most importantly, give you the opportunity to ask questions about their career paths.

Please note that the main language will be German, but spontaneous language switches are possible. No registration is required.

Organized by the Cognitive Psychology Section of the DGPs.

Special & Social Events

Conference Dinner

When? Tuesday, March 17, from 6:30 p.m. until midnight

Where? Neckawa (Wöhrdstraße 25)

www.neckawa.de

This year's Conference Dinner will take place at Neckawa, situated at the banks of the river Neckar, which flows through the heart of Tübingen.

Entrance tickets for the dinner need to be purchased during online registration for the TeaP.

Tickets include an aperitif, appetizers, a main dish, and a dessert, along with two drink vouchers. Vegan, vegetarian, gluten-free and nut-free options are available.

A live band, "Call Me Heike", accompanies the dinner and sets the mood, and afterwards a DJ, "timodufner", keeps the music going.

We look forward to seeing you there!

NECKAWA
GASTRONOMIE & EVENTS

Special & Social Events

Poster Award Ceremony

When?	Wednesday, March 18, from 1:30 to 2 p.m
Where?	Hörsaalzentrum Morgenstelle: Lecture Hall N6

Poster Awards will be given to the three winners elected by the DGPs committee right before the keynote on Wednesday after the lunch break.

If you would like to nominate your poster, please find more information at "Information for Presenters and Chairs" on the TeaP 2026 website, where detailed information about poster presentations is provided.

On the poster walls during the poster sessions of the conference and in the poster section of this booklet, posters by finalists are marked with this badge:



Organized by the Cognitive Psychology Section of the DGPs.

Special & Social Events

Guided City Tour (available in German and English)

When?	Wednesday, March 18, from 5:30 to 7:00 p.m.
Where?	Starting from 'Neckarinsel' next to the stairs and bus stop 'Neckarbrücke'

For conference participants who are staying in Tübingen a little longer: Explore the city with a guided tour that covers the most important sights of Tübingen's old town, with detailed explanations of the city's history as well as entertaining stories about curious incidents and remarkable people.

If you would like to participate, please sign up when registering for the TeaP 2026, while indicating whether you prefer to join the German group or the English group.

Symposia

* Asterisks indicate presenters

Working Memory Development Across Childhood: Behavioral, Cognitive, and Educational Insights

Monday, March 16, 09:00 - 10:30, HSZ - N1

Chair(s): Seyma Nur Ertekin¹, Mathieu Zaugg²

¹University of Amsterdam, Netherlands

²University of Geneva, Switzerland

Working memory (WM) is central to human cognition, underpinning a wide range of complex cognitive functions. Many daily activities, like reading or following a conversation, depend on it. It is a dynamic system that undergoes substantial changes throughout childhood, and consequently, its interactions with other cognitive systems also evolve. Understanding the effects of WM development is therefore essential for elucidating broader cognitive growth. This symposium brings together researchers investigating the development of working memory in childhood through complementary perspectives, ranging from large-scale adaptive data modeling to experimental and eye-tracking approaches.

In this symposium, we will first target the question of how WM capacities develop and to what extent WM is necessary for developing mathematical abilities in primary school children. In the second part, we will focus on proactive functioning, that is, the capacity to anticipate and prepare ourselves for a task. We will discuss when it emerges in WM, how it develops across ages, and how to assess the presence or absence of proactive strategies. Finally, we will discuss the links between the sensorimotor system and WM, by presenting the effect of a body movement-based strategy on WM performance. Collectively, these insights will offer a comprehensive and diverse overview, unified by a shared emphasis on the mechanisms and developmental trajectories of working memory in childhood.

Keywords: Working Memory Development, Proactivity, Cognitive Development, Numerical Ability, Primary Education, Embodied Cognition

Working Memory Development in Children: Using Large-Scale Adaptive Learning Data in the Mathematical Domain

Seyma Nur Ertekin^{1*}, Abe Hofman¹, Julia Haaf²

¹University of Amsterdam, Netherlands

²University of Potsdam, Germany

Working memory (WM) develops throughout childhood and is a strong predictor of mathematical ability. To better understand the trajectory and constraints of cognitive development, it is essential to examine how WM changes during childhood. To this end, we analyze data from over 100,000 Dutch primary school children (ages 6–12) who completed a spatial serial recall task within an adaptive learning platform, enabling the study of working memory in a regular educational context. We first examine the development of WM capacity across primary school age and highlight difficulties with estimating WM capacity based on the set size and structure of the items played. Next, we investigate the relationship between WM and mathematical abilities using both cross-sectional and longitudinal data. Cross-sectional correlations show associations between WM and mathematical domains, with domain-specific differences across primary school years. Furthermore, longitudinal analyses examine the role of WM in mathematical learning over time. Together, these findings provide valuable insights into the development of WM processing in children and underscore the value of large-scale online educational data to better understand the relationships between different ability domains.

Keywords: Working Memory Development, Adaptive Online Learning, Mathematical Ability

The Roles of Non-Symbolic and Symbolic Numerical Skills and Working Memory for Mathematical Skills in Primary School

Vroni Hischa^{1*}, Frank Niklas², Korbinian Moeller^{3 4}

¹Department of Psychology, Catholic University of Eichstaett-Ingolstadt, Germany

²Department of Psychology, University of Munich (LMU), Munich, Germany

³Department of Mathematics Education, Loughborough University, Loughborough, United Kingdom

⁴LEAD Graduate School & Research Network, University of Tuebingen, Tuebingen, Germany

The development of mathematical skills is influenced by both domain-specific numerical as well as domain-general cognitive skills such as working memory. However, so far, their contributions to mathematical skills have hardly been investigated jointly within one comprehensive study. Hence, the present study intended to evaluate the specific contributions of non-symbolic and symbolic numerical skills and working memory to mathematical skills and potential developmental changes across primary school years. A total of 486 children from first to fourth grade (between 6 and 11 years of age) were assessed on (non-)symbolic magnitude comparison, approximate addition, number line estimation, WM, general cognitive ability, and their mathematical skills. Based on the results of a multi-group path model, number line estimation was a significant predictor of mathematical skills in all four grade levels. Working memory was a significant predictor of mathematical skills in third and fourth grade, while general cognitive ability was a significant predictor of mathematical skills in first, third, and fourth grade. Pairwise comparisons of path coefficients indicated contributions of number line estimation were significantly stronger in third than in first and second grade. Taken together, these results suggest that symbolic and working memory, but not non-symbolic numerical skills, significantly contribute to the development of mathematical skills in primary school years. This may reflect the impact of formal mathematics instruction.

Keywords: mathematical skills, primary school, non-symbolic numerical skills, symbolic numerical skills, working memory, developmental changes

Emergence and development of proactive response planning from childhood to adulthood

Mathieu Zaugg^{1*}, Naomi Langerock¹, Dominic Guitard², Virginie Mossière¹, David Popescu¹, Evie Vergauwe¹

¹University of Geneva, Switzerland

²Cardiff University, United Kingdom

Proactivity, the ability to anticipate and prepare for future cognitive demands, has long been assumed to only emerge around age 7 in working memory (e.g., Flavell, 1966; Chevalier et al., 2014; Morey et al., 2018). In the present study, based on the study by Chevalier et al. (2014), we investigated the development of a specific proactive strategy, the planning of sequences of responses. For this purpose, we tested three age groups: younger children (age 4-5), older children (age 9-10) and adults, with a three-variants simple span task. Contrarily to Chevalier et al. (2014) who did not find proactive behavior before age 7, we could demonstrate the presence of the proactive strategy of planning response sequences in the younger children in two out of our three variants, whereas older children and adults showed it in all three variants. Therefore, it seems that children below 7 are capable of planning sequences of responses, but in a less consistent and systematic way than older groups. The implications of these findings, as well as potential reasons for their divergence from earlier results, will be discussed.

Keywords: Working Memory, Developmental differences, Proactivity, Planning

Do children use proactive strategies consistently when remembering? Insights from eye movements.

Genevieve Lawson^{1*}, Tanja Könen², Julia Karbach², Nicolas Chevalier³, Candice Morey¹

¹Cardiff University, United Kingdom

²RPTU University of Kaiserslautern–Landau, Germany

³The University of Edinburgh, United Kingdom

Remembering information is a key element in everyday life, whether it be remembering the directions to the new restaurant you want to try or new information learnt in the classroom. Children between the ages of 5 to 7-years-old transition from predominantly using reactive cognitive control strategies to engaging proactive cognitive control strategies, where goal relevant information is maintained. This transition helps explain why we see working memory ability improve across childhood, as children can more accurately and quickly recall information. This study aimed to investigate whether children aged 6 to 11-years-old consistently used proactive cognitive control strategies across two tasks: cued task switching and backwards Corsi. Eye tracking methods were used to monitor gaze patterns to provide additional indicators of proactive control beyond any behavioural advantages such as faster responses when cues were utilized, or increased recall. The results show that children do not consistently apply proactive cognitive control strategies across both tasks and that the use of proactive cognitive control in a cued task switching task is not clearly associated with higher backwards spatial span. This suggests that whilst children in this age group should predominantly be using proactive cognitive strategies to more successfully complete tasks, they do not consistently apply these strategies when remembering information and instead appear to be using different strategies across tasks, possibly because they are not yet capable of effectively using these strategies.

Keywords: Working memory development, executive function, cognitive control, eye movements

Effects of an embodied cognition inspired strategy to enhance working memory performance, in 7- and 9-years old children.

Dalia Kerimici^{1*}, Christophe Fitamen¹

¹University of Fribourg, Switzerland

The embodied-cognition theory proposes that our sensorimotor system influences our cognitive capacities, including memory (Lakoff & Johnson, 1980; Borghi & Cimatti, 2009). Previous research investigated the effects of encoding strategies using mime and their efficacy on recall (Allen, 1995; Tellier, 2005, 2006, 2008; Pishgadam et al., 2010; Dickson & Stephens, 2015; Steffens et al., 2015; Roze et al., 2018). The present study tested whether a learning strategy based on body movements could enhance children's performance in a working memory task. To test our hypothesis, 7- and 9-years old children completed a complex span task. The task consisted of series of words that were said out loud by an experimenter and had to be immediately recalled by the children, while completing a colour denomination concurrent task. Participants were divided into three conditions; a control group, which was only listening to the words said by the experimenter, an experimental group, that had to listen to the words, see the experimenter mime them, and reproduce the gestures, and finally a comparison group, that had to listen to the words and look at the experimenter's mimes. The results showed that the use of mimes during the encoding enhanced the overall correct recall, in both 7- and 9-years old children.

Keywords: Working Memory (WM), Children, Mime, Embodied cognition theory, Encoding strategies

A New Counterpart? Cognitive Foundations of Human-AI Interaction

Monday, March 16, 09:00 - 10:30, HSZ - N2

Chair(s): Lea Marie Petrasch¹

¹Universität Münster, Germany

As artificially intelligent systems become embedded in daily life, understanding the cognitive foundations of our interactions with them is essential for shaping the future of human-technology relations. This symposium brings together complementary perspectives that examine how humans think, perceive, and interact with intelligent systems, focusing on social robots and large language models (LLMs). The studies contribute toward a deeper understanding of contexts and cues under which we perceive and act toward AI as social units or actors (Gambino et al., 2020; Nass et al., 1994). The first contribution by Katharina Kühne compared the perception of robotic and human agents, through motor resonance, finding that both evoke comparable implicit motor responses irrespective of anthropomorphic detail or biomechanical feasibility. These results highlight how humans simulate robotic agents internally. The second study by Jairo Perez-Osorio examined how the reliability of a humanoid robot's gaze affects human-robot collaboration, finding that consistent gaze improved attentional alignment, task efficiency, and coordination, while unreliable gaze disrupted performance. The findings highlight the critical role of social cues in supporting adaptive joint action with artificial agents. Two further contributions focus on the communication with chatbots. In four rounds Anita Körner compared the performance in a classic referential communication task between a basic version of a conversational agent (Chat-GPT) versus a version that was prompted to use grounding strategies. She found that time per round decreased, even more so for the group who interacted with the conversational agent prompted with grounding strategies, indicating more common ground. Lea Petrasch investigated whether humans apply linguistic perspective taking when communicating with chatbots (LLMs). Adapting Keysar's (1994) paradigm on the illusory transparency of intention, results showed an egocentric bias in judgements of the chatbots' understanding. To round things off, Marcel Binz will discuss foundational unified models of human cognition. Models that not only predict, simulate, and explain behavior in a single domain but instead offer a unified take on our mind. Together, these contributions foster understanding on how humans make sense of artificial communicators and how cognition and perception of such can be studied best in a digital social world.

Keywords: cognition, human-AI interaction, anthropomorphism, social robots

Do we mirror robots? Investigating human grip force in response to robotic hand movements

Katharina Kühne^{1*}, Emily Evermann², Mandana Leandra Tiurma Sutter²

¹University of Potsdam, Germany

²Technical University of Berlin (TU Berlin), Germany

The integration of social robots into everyday life has intensified interest in the neural and perceptual mechanisms underlying Human–Robot Interaction (HRI). Motor resonance, supported by the mirror neuron system (MNS), plays a key role in action perception and understanding, and may vary depending on an agent’s anthropomorphism and the biological plausibility of its movements. However, empirical evidence remains inconsistent. In two within-subject experiments ($N = 24$; $N = 27$), we examined implicit motor responses while participants viewed static images of human and robotic hands differing in anthropomorphic design and biomechanical plausibility. Analyses revealed no significant differences in motor resonance strength across conditions, with Bayesian results further supporting the null hypotheses. These findings suggest that both human and robotic stimuli evoke comparable motor resonance and perceptual processing, irrespective of anthropomorphic detail or biomechanical feasibility. The results contribute to a deeper understanding of how humans perceive and internally simulate robotic agents in social contexts.

Keywords: anthropomorphism, grip force, Human–Robot Interaction, impossible movement, motor resonance

Gaze Reliability Modulates Attentional Orienting and Joint Performance in Human-Agent Collaboration

Jairo Perez-Osorio¹, Eva Wiese^{1 2*}

¹Technical University of Berlin, Germany

²George Mason University, United States

Effective human-agent interaction relies on the ability to integrate social cues and dynamically allocate attention during joint action. In this study, we investigated how the reliability of a humanoid robot's gaze affects cognitive processing and cooperative performance in a shared visual search task. Participants collaborated with the NAO robot in a time-constrained, turn-taking paradigm, with the robot's gaze either consistently aligned with task goals or uninformative. Critically, participants were not informed about this manipulation. Reliable gaze led to significantly faster target selection and more efficient coordination, indicating enhanced attentional alignment between human and robot. Unreliable gaze increased response latencies and disrupted joint performance, revealing the cost of inconsistent social signals. Additionally, post-interaction ratings showed that participants in the reliable condition perceived the robot as more responsive. In contrast, those in the unreliable condition reported decreased confidence in the robot's behavior under changing conditions. Crucially, reaction time differences emerged even though participants reported no awareness of the gaze manipulation, demonstrating that behavioral measures reveal adaptation before it surfaces in explicit evaluation. By integrating continuous metrics with self-report scales, this study shows that reaction times capture millisecond-level behavioral adjustments during interaction. At the same time, questionnaires identify which qualitative dimensions (such as responsiveness or reliability) drive post-hoc attitudes. These findings offer insights into the cognitive mechanisms supporting adaptive human-robot collaboration and highlight the value of multimodal assessment in the design of socially intelligent systems.

Keywords: Gaze Following, Joint Attention, Social Cognition, Attentional Orienting, Human-Robot Interaction, Collaborative Performance, Embodied Agents

Finding common ground with a chatbot

Anita Körner^{1*}

¹University of Kassel, Germany

During conversations, people establish and rely on common ground. For example, they converge on modes of turn taking and on referential terms. The establishment of common ground leads to faster and less error-prone communication. The present experiment examines whether grounding mechanisms from human communication generalize to communication with conversational agents (here, a custom version of ChatGPT). Participants were assigned to interact either with a basic version of a conversational agent or a version that was prompted to use grounding strategies. We used a classic referential communication task and assessed performance. In four rounds, participants were asked to determine the correct order of complex shapes by interacting with the conversational agent, who knew the correct order. As typical in human-human dyads, time per round decreased when participants performed the referential communication task with a conversational agent. Moreover, the decrease was more pronounced for the group interacting with the conversational agent prompted with grounding strategies (vs. the basic conversational agent), indicating more common ground. We conclude that grounding with conversational agents and grounding with humans rely on overlapping mechanisms, so that conversational agents could be improved by incorporating human grounding principles.

Keywords: communication, language, common ground, AI, conversational agents

The Illusory Transparency of Intention: Cognitive Biases in Human-AI Dialogue

Lea Marie Petrasch^{1*}, Regina Jucks¹

¹University of Münster, Germany

People do not just use computers, they often treat them as social actors (CASA paradigm; Gambino et al., 2020; Nass et al., 1994). Yet, effective communication requires assessing one's interlocutor's (lack of) knowledge, known as perspective taking (Nickerson, 1999). Individuals frequently neglect this and assume that others grasp their intended meaning – reflecting a well-documented egocentric bias (Keysar, 1994; Lau et al., 2022). In two studies we explored whether individuals (mistakenly) expect Large Language Models to infer an intended meaning, even when the necessary context is unavailable to the system (illusory transparency of intention). In a 1 x 2 within-subjects design, we varied privileged information (negative vs. positive) in six chatbot-student scenarios. Our first study used edited screenshots (visual stimuli), whereas our second study focused on the voice function of chatbots (auditive stimuli). In two online surveys participants were introduced to a scenario and then judged whether the chatbot would interpret the last statement as sarcastic. In a second round, participants reported their own perception of sarcasm and predicted the chatbot's response. Our results showed significant differences between the two conditions: participants assumed more perception of sarcasm and more sarcasm-congruent responses when negative privileged information was present. Thus, the illusory transparency of intention applies to communication with LLMs. Individuals show an egocentric bias in assessments of their interlocutor's understanding even when this interlocutor is not human.

Keywords: Perspective taking, Human-Computer Interaction, Egocentric Bias, Large Language Models

Foundation models of human cognition

Marcel Binz^{1*}

¹Helmholtz Munich, Germany

Establishing a unified theory of cognition has been an important goal in psychology. A first step towards such a theory is to create a computational model that can predict human behaviour in a wide range of settings. I will present our ongoing work on Centaur, a computational model that can predict and simulate human behaviour in any experiment expressible in natural language. We derived Centaur by fine-tuning a state-of-the-art language model on a large-scale dataset called Psych-101. Psych-101 has an unprecedented scale, covering trial-by-trial data from more than 60,000 participants performing in excess of 10,000,000 choices in 160 experiments. Centaur not only captures the behaviour of held-out participants better than existing cognitive models, but it also generalizes to previously unseen cover stories, structural task modifications and entirely new domains. Furthermore, the model's internal representations become more aligned with human neural activity after fine-tuning. Taken together, our results demonstrate that it is possible to discover computational models that capture human behaviour across a wide range of domains. We believe that such models provide tremendous potential for guiding the development of cognitive theories, and we present a case study to demonstrate this.

Keywords: cognitive science, computational modeling, large language models

From Flow to Frame: The Role of Events and Boundaries in Human Cognition

Monday, March 16, 09:00 - 10:30, HSZ - N3

Chair(s): Karin Maria Bausenhardt¹, Markus Huff², Jeffrey M Zacks³

¹University of Tübingen, Germany

²Leibniz-Institut für Wissensmedien, Germany

³Washington University in Saint Louis, United States

Human cognition is shaped by the way humans perceive and segment continuous, dynamic, complex, and multimodal perceptual input into meaningful, discrete episodes. Such events and their boundaries (transitions that separate meaningful units of experience from each other) play a crucial role in structuring memory, guiding attention, and enhancing understanding. Perceiving an event boundary - for example, triggered by changes in time, location, protagonist, goal, or social interaction - evokes updates in working memory and thereby prompts the formation of new or adaptation of existing event models. This segmentation process may thus enhance comprehension and recall by creating clear divisions between contexts, allowing individuals to better encode, retrieve, and reason about sensory experience. Events and their boundaries also influence predictive processes: within a given event, reliable forecasts can be made based on contextual continuity and abstract event schemata, but predictions become less reliable when crossing event boundaries. Recent models suggest that increased uncertainty and error in predictive processing in itself may drive the updating of event models in working memory, thus reinforcing the link between predictive processing and event segmentation. Overall, events and their boundaries serve as fundamental units of organization in cognitive processing, enabling humans to make sense of and coherently act upon a dynamic and often unpredictable world. In this symposium, we will present novel empirical and theoretical developments from psychology and cognitive science that explore the functions and mechanisms of event cognition. We will focus in particular on how boundaries affect the perception and segmentation (vs. integration) of dynamic input, how event models are formed within and across modalities, and how dynamic input, schema-based prediction, and contextual factors interplay to shape event representations and higher-level cognitive processes such as categorization, memory, and problem-solving.

Keywords: event models, event schemata, prediction, segmentation, dynamic perception, narrative comprehension

Tracking objects beyond view boundaries: role of attention, memory and metacognition

Jiri Lukavsky^{1*}

¹Institute of Psychology, Czech Academy of Sciences, Czech Republic

In everyday life, we often need to keep track of multiple objects in our environment. Moreover, these objects get occluded or move out of our visual field and we must rely on our memory. We have showed that tracking objects which often disappear beyond the view's boundary is possible but difficult (Lukavský et al., 2023). Interestingly, under these difficult settings people achieved similar performance in tracking identities relative to usually easier location tracking. We concluded that once people cannot rely on grouping mechanisms, they start to employ additional strategies. In a subsequent experiment, we decided to assess both confidence and performance in multiple object tracking task. We tested 50 children (age 5 to 7 years) with a gamified version of the task where they tracked 1 to 3 targets out of 8 objects and they assigned one or two stars to each target candidate marking their confidence in the response. After each trial, they were shown the correct responses and how their score adjusted based on the number of stars and correctness of the response. We found no age-related differences in the tracking accuracy (mean 79%) or score (mean 85 out of 132, range 26 to 128). We observed some age-related responses patterns, e.g. younger kids tended not to maximize their score in easy tasks. While the ability to assess confidence might seem unrelated to tracking performance, it aids participants in making informed guesses, thereby influencing their overall performance implicitly.

Keywords: attention, multiple object tracking, occlusion, memory, metacognition

Experimental Insights into Narrative Comprehension: The Role of Event Boundaries and Codality

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Narratives are central to human cognition and societal participation, providing the means by which individuals organize their experiences, communicate meaning, and coordinate understanding. Comprehending narratives requires transforming the continuous flow of perceptual and linguistic input into structured representations of events and maintaining coherence across changing contexts. Our experimental program investigates how such transformations are guided by event boundaries and representational codality. Across a series of behavioral studies using visual narratives (i.e., comics), we provide converging evidence for distinct cognitive processes underlying narrative understanding. Measures of viewing time, event segmentation, and comprehensibility indicate that large coherence breaks elicit the construction of new event models, whereas smaller disruptions engage inferential updating within an ongoing representation. When information crosses representational codalities—such as between images and text—processing costs increase, reflecting the effort of recoding between symbolic systems. Temporal analyses further demonstrate that this cross-codal integration occurs immediately upon encountering new codality information. Together, these findings support an integrative framework in which segmentation, updating, and cross-codal recoding jointly structure narrative comprehension. Event boundaries emerge as moments of cognitive reorganization that coordinate attention, working memory, and prediction, allowing continuous experience to be framed into meaningful, communicable units. This synthesis connects empirical evidence from narrative processing with broader theories of event cognition, memory, and predictive control in complex dynamic environments.

Keywords: event cognition, narrative comprehension, cross-codal integration

The Role of Matching versus Mismatching Granularity in Cross-Modal Event Memory

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Theories of multimodal learning, such as Dual Coding Theory, posit that aligning information across sensory channels is a key mechanism for building coherent event models. A direct prediction is that matching the granularity of information (e.g., fine- vs. coarse-grained details) between verbal and visual modalities should facilitate integration and enhance memory. We put this hypothesis to a test across two experiments. Participants viewed text and video presentations of everyday activities where granularity was systematically matched or mismatched. Recognition memory was assessed using a sensitive task designed to detect the benefits of alignment. Contrary to these theoretical foundations, we found no reliable benefit of cross-modal granularity matching on memory sensitivity, false alarms, or confidence. Bayesian analyses provided substantial evidence for this null effect. The critical factor was not alignment, but timing: memory was significantly superior when verbal descriptions preceded the video, scaffolding initial encoding. These findings pose a significant challenge to the assumption that structural alignment is a primary driver of multimodal integration in event memory. Instead, they demonstrate that the initial conditions of encoding—specifically, the order of presentation—can override the putative benefits of cross-modal congruence, forcing a reevaluation of how and when multimodal inputs effectively shape event models.

Keywords: Memory, Cross-Modal Integration, Granularity, Amodal Abstraction, Timing

Context- and event-predictive-inference go hand-in-hand

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While we all receive continuous, dynamic sensory and motor information about our bodies and the outside environment, phenomenologically, we perceive a stable spatiotemporally segmented world. That is, we perceive and control dynamic interaction events as well as stative, durative events. We can even name these events verbally. Recent evidence suggests that event perception as well as the choice and execution of eventive interactions with our environment is embedded in a contextual frame, which appears to seamlessly focus cognition solving the frame problem. Within this contextual frame we plan, process, and control our perception, attention, and behaviour. Our cognitive modelling work shows that the installation of a contextual frame yields simulated model behaviour that best fits with human behaviour. Meanwhile, the work shows that contextual frame inference minimizes cognitive effort, which is quantified as changes in belief densities. Projecting the principle of contextual frame inference into problem solving domains – such as when solving tasks of an intelligence test or tasks of the abstraction and reasoning corpus (ARC) benchmark – similar contextual framing seems to be key to infer task-suitable eventive interactions and event progressions. It thus appears that cognition is segmented into events that are embedded into self-inferred contextual frames. The precise structure of such contextual frames, their goal-directed inference, and their more general involvement in cognition, however, still needs to be studied in further detail.

Keywords: Event cognition, Context, Frame problem, Problem solving, Task switching

Modeling human event comprehension at human scale

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A grand challenge for cognitive science and neuroscience is to explain how the human brain forms and updates stable representations of events in the stream of behavior. One family of theories propose that event updating is triggered by transient failures in prediction quality. Prediction quality has two aspects, prediction error, or surprisal; and uncertainty, or entropy. One major barrier to understanding their roles has been constructing experimental paradigms and computational frameworks that can be directly compared to human behavior and brain activity. A second barrier is posed by the fact that in naturalistic activity, these two potential signals are correlated. This means it takes a relatively large sample of activities to tease them apart. In this talk, I will describe a large corpus of highly instrumented action recordings and accompanying behavioral and functional MRI measurements. Using these together with a computational model, we have tested the roles of prediction error and prediction uncertainty in event updating. The data support important roles for both signals in human event comprehension.

Keywords: event segmentation, prediction error, prediction uncertainty

Part I: Computational Models of Confidence and Metacognitive Ability

Monday, March 16, 09:00 - 10:30, HSZ - N4

Chair(s): Sascha Meyen¹, Simge Hamaloğlu¹

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The ability to judge one's own confidence is a core ability of human metacognition. Giving informative confidence ratings is crucial in many situations: Humans making decisions, either individually or in groups, rely on their own estimates of uncertainty. But finding adequate measures for the quality of confidence ratings is a challenge. The two major approaches to tackle this challenge will be contrasted in this symposium: model-based and model-free. On the one hand are computational process models of the formation of confidence ratings in humans. The first speaker, Matthias Guggenmos, provides an overview and categorization of these models. One of them is the most prominent model, which is an extension of classical signal detection theory (where perceptual sensitivity, d' , is measured). This metacognitive extension analogously measures metacognitive sensitivity, meta- d' . Together with nine others, this prominent model is evaluated on a collection of 13 experimental data sets by the second speaker, Manuel Rausch. His results should concern researchers in the field: The meta- d'/d' model does not provide satisfactory results. The third speaker, Simge Hamaloglu, drills deeper into the model's mechanisms: As in classical signal detection theory, the meta- d'/d' model estimates (metacognitive) criteria that determine the point where low turns into high confidence. She focuses on these criteria to differentiate when a stimulus is actually perceived versus only inferred from other cues. Contrasting these model-based approaches, on the other hand, classical information theory has inspired approaches to measuring metacognitive ability in a model-free way. The fourth speaker, Sascha Meyen, introduces this idea in which metacognitive ability is measured as transmitted information (in bits). The fifth speaker, Daniel Fitousi, expands the repertoire of these information-theoretic measures, which offer the exciting possibility of comparing metacognitive abilities across different cognitive architectures. Taken together, this symposium will pinpoint the contention between model-based and model-free approaches to measuring metacognitive ability. It will highlight challenges in terms of empirical fit and interpretability, and thereby guide future development of both approaches in tandem.

Keywords: confidence, meta- d' , type 2 performance, metacognition

Meet the family: a taxonomy of computational confidence models

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Computational models of confidence have become central to understanding how agents - biological or artificial - infer, evaluate, and act upon uncertainty. By now, it is largely consensus that accurate inferences about metacognitive characteristics require explicit modeling of the hierarchy linking type 1 decisions to type 2 judgments. A broad range of models have been proposed with distinct architectures and varying hierarchical stages at which metacognitive noise and bias are assumed to emerge. My goal in this talk is to (1) delineate the core components that models of confidence should encompass, (2) organize existing approaches within a coherent framework, and (3) identify promising directions for future research - including an important role of model-free measures such as those derived from information theory.

Keywords: confidence, metacognition, computational modeling, uncertainty, decision-making

A comprehensive comparison of static models of perceptual confidence

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Recent years have seen a substantial proliferation of computational models of confidence and metacognition. The most widely used model—typically assumed without explicit discussion or empirical validation—is the Independent Truncated Gaussian (ITG) model, which underlies the popular meta- d'/d' measure of metacognitive ability. However, previous modelling studies of perceptual confidence have not included the ITG in formal model comparisons. In the present study, I compare the fit of the ITG to ten alternative models of confidence and metacognition, all derived from signal detection theory, in a reanalysis of 11 previously published experiments and two new ones. Across all 13 experiments, at least one alternative model provides a better fit than the ITG.

In masked orientation discrimination, low-contrast discrimination, and random-dot motion tasks, the best fits were obtained by either the Weighted Evidence and Visibility model or its lognormal variant, suggesting that at least two sources of evidence underlie perceptual confidence—one related to the discrimination judgment and another to the reliability of perceptual evidence. In a line-length discrimination task, the best fit was achieved by the Independent Gaussian model (without truncation), implying that confidence in this task is primarily informed by evidence related to the discrimination choice collected in parallel to the decision process. Finally, in a dot-numerosity discrimination task, the best fit was obtained by the Signal Detection Rating model, indicating that confidence can, in this specific case, be explained by the decision process alone. Overall, these results suggest that the field's widespread reliance on meta- d'/d' is misplaced.

Keywords: Perceptual confidence, cognitive modelling, signal detection theory, metacognition, meta- d'/d' , weighted evidence and visibility model

From Experience to Insight: How Familiarity Shapes Confidence in Event Completion

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Accurately judging one's own confidence is key in metacognition and essential for understanding how people evaluate their perceptual experiences. In dynamic environments, however, perception often involves information that is not directly seen but inferred. This process, known as event completion, allows for coherent perception but also introduces uncertainty about what was actually perceived. Understanding how people evaluate their confidence in such situations offers new perspectives on metacognitive insight. In this work, we investigate how familiarity and repeated exposure influence event perception and confidence. Using soccer videos as stimuli, we examine how observers with different levels of domain knowledge perceive and evaluate partially omitted actions. Across three measurement points, participants repeatedly view the same events, allowing us to trace how event schemas develop over time and how these changes affect perceptual decisions and confidence. We present two studies that build on initial findings and extend them by examining event perception across repeated exposures in a broader population. We expect that increasing familiarity will enhance detection accuracy for causally implied continuations, reflecting a refinement of internal event representations. Confidence judgments, however, may not fully capture these changes, revealing limits in metacognitive awareness. To link these behavioral findings to broader metacognitive modeling approaches, we use hierarchical analyses to compare confidence distributions across conditions. This model-based perspective identifies whether confidence reliably tracks inferred versus directly perceived information and provides insights into how familiarity shapes the calibration of confidence in event perception.

Keywords: event completion, metacognitive efficiency, confidence, Signal-Detection Theory

How to Interpret Information-Theoretic Measures of Metacognition?

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Metacognition research investigates humans' ability to estimate the uncertainty of their mental states about the world. Ideally, measures of this ability are independent of how accurate humans are overall: Making correct predictions about the world (Type 1 performance) is a somewhat separate ability from knowing which predictions are correct and which are not (Type 2 performance). However, the most established measures of Type 2 performance, meta-d' and M-ratio, are based on a signal detection theory model. Such model-based approaches can fail to disentangle Type 1 and 2 performances when their model assumptions are violated. A potential solution to dependency on assumptions of these model-based approaches are model-free approaches based on information theory, which use transmitted information as key quantity. We present tight upper and lower bounds on the range of values transmitted information can assume. Based on these bounds, we propose a normalized measure of Type 2 performance: For a fixed Type 1 performance, this measure always assigns a value of 1 when the highest possible Type 2 information is transmitted, and 0 when the lowest possible Type 2 information is transmitted. This way, we disentangle Type 1 and Type 2 information and avoid problematic behavior of the model-based measures in which Type 1 abilities are attributed to Type 2 performance. However, information-theoretic measures come with some difficulties in terms of interpretation. Here, we clarify the advantages and challenges of these model-free, information-theoretic measures of metacognitive ability.

Keywords: metacognition, Type 2 performance, information theory, meta-d'

Binding and Learning: Same Same, but Different?

Monday, March 16, 09:00 - 10:30, HSZ - N5

Chair(s): Carina G. Giesen¹

¹HMU Health and Medical University Erfurt, Germany

A growing body of literature documents that perception and action are supported by short-lived bindings between stimulus and response features. Notably, the relationship of binding and retrieval processes and learning mechanisms is complex and a point of ongoing debate in current cognitive research. While the concepts of binding and retrieval as proposed in action control research, e.g., by the Binding and Retrieval in Action Control (BRAC) framework, closely resemble processes in learning and memory on a theoretical level, empirical findings largely oppose a close relation. In this symposium, we explore recent views on the relations between binding and retrieval and learning processes across different types of learning effects. We will present findings from a broad range of experimental paradigms like stimulus-response and response-response binding, contingency learning, and evaluative conditioning. These data will be used to highlight different perspectives on the intersections of binding and learning effects. Five talks will unravel how potent factors like contingency awareness, number and frequency of presentations, and time since the last stimulus occurrence affect binding/retrieval and/or learning effects. Together, these findings further our understanding of the relation between binding and learning.

Keywords: stimulus-response binding, response-response binding, contingency learning, episodic retrieval, action control, awareness

The durability of bindings between distractor stimuli and responses revisited – a case for contingency awareness?

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Typically, bindings between response irrelevant stimuli and responses completely decay within two seconds after their integration (Frings, 2011). However, it was shown that these associations between task irrelevant stimuli and responses were much longer lived if their particular combination was repeated five times (Frings et al., 2015). Here, we analyze whether this relative longevity of repeated stimulus-response bindings hinges on contingency awareness between stimulus and response. Participants judged the sizes of depicted objects that were presented to the left and right of a marked fixation. Different response irrelevant stimuli were used as fixation marks and were presented five times with the same response (but always with different targets). In addition, participants answered items indicating their contingency awareness. Preliminary data indicate that prolonged stimulus-response binding effects relied on awareness for the stimulus-response contingency. The data will be discussed regarding the interface between moment to moment effects of action control and longer term learning.

Keywords: action control, learning, binding, retrieval

Underlying sources of genuine response-response contingency learning

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Research on habit formation is focused on demonstrating that implicit learning of regularities contributes to automatized behavior. Contingency learning paradigms provide an ideal test-bed to investigate this hypothesis. Recent studies on stimulus-response contingency learning (SR-CL) have shown that a large part of the SR-CL effect is explained by retrieval of a single most recent episode and thus should not be considered learning proper. Furthermore, the small residual SR-CL effect can be explained entirely by contingency awareness, suggesting that SR-CL reflects the functioning of propositional knowledge rather than the formation of associations. In the present study, we investigated response-response contingency learning (RR-CL), which is a more promising candidate for capturing implicit learning of action sequences. In a pre-registered study ($n = 40$), we obtained robust RR-CL effects, even after controlling for episodic retrieval of the most recent RR sequence. This residual RR-CL effect partially depended on contingency awareness; however, a residual RR-CL effect was also obtained in the absence of contingency awareness. These results suggest that the principles underlying learning of action sequences differ from those that characterize the learning of SR contingencies. The findings suggest that a large part of response sequence learning occurs automatically and outside of awareness, possibly reflecting the formation of RR associations.

Keywords: Contingency learning, action sequences, episodic response retrieval, response-response binding, contingency awareness, propositional knowledge, implicit learning

How sequences of stimulus-response combinations affect episodic retrieval in a color-word repetition paradigm

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Current theories of binding and learning propose that transient episodic bindings between stimulus and response features provide the foundation for forming long-term S-R associations (Frings et al., 2023). Across two high-powered, pre-registered experiments (total $N = 163$), we found that the stimulus-response binding and retrieval effect increased linearly with each additional episode contributing to an uninterrupted repetition of the same S-R combination. To test whether such repeated exposure yields an abstract, stable, non-episodic S-R association in long-term memory, we examined whether the influence of an uninterrupted series persists after a single intervening, mismatching episode that contradicts the series. Our results show that the repetition effect does not modulate retrieval for S-R combinations deviating from the series and thus does not survive even a single mismatching episode, despite 10 or 11 prior repetitions. Hence, the increased retrieval effect for long series of matching episodes does not indicate a transition from episodic bindings to long-term associations but likely reflects an increased probability of retrieving a matching S-R episode from memory. In sum, we found no convincing evidence that mere S-R repetitions – independent of higher-order processes such as hypothesis testing or propositional reasoning – are sufficient to form stable, abstract, non-episodic S-R associations that operate independently of episodic binding and retrieval.

Keywords: Stimulus-response binding and retrieval, event coding, learning, memory, action control

The influence of number of repetitions and timing on SR-contingency learning and action control

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In human action control research, binding and retrieval provide comprehensive accounts of the common coding between perception and action. The connection between these constructs and fundamental components of memory theories, namely encoding and retrieval (Melton, 1963; Roediger & Abel, 2022) remains unclear. In the presented study, we start to investigate a possible route of learning from short term stimulus-response bindings to longer term memory for associations. For that we use a setup that can be assumed to produce short-term binding effects between responses and task irrelevant stimuli. Participants categorize the frame of pictures via left and right keypress. In addition we introduce contingencies between picture identity and response side during a learning phase. Learned contingencies are measured in a following test phase. Both the number of repetitions of picture-response combinations and the delay between practice and test phases systematically varies across different contexts. We expect larger contingency effects with increasing numbers of repetitions of stimulus-response combinations during practice and an additional impact of the last stimulus-response occurrence only for short but not for long delays between practice and test. The findings are discussed regarding insights they can provide into how binding effects are influenced by the repetition frequency of feature combinations, as well as the strength and potential consolidation of these bindings over time.

Keywords: Action control, stimulus-response binding, learning.

The last impression counts: Recency retrieval effects in Evaluative Conditioning

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Liking of a previously neutral stimulus can change based on co-occurrences with positive or negative stimuli, a phenomenon denoted evaluative conditioning (EC). Prior research suggests that EC depends on information about previous stimulus pairings that is remembered when the neutral stimulus is evaluated. According to recent findings, from contingency learning (Rothermund et al., 2025), the temporal distance to the last occurrence of a given stimulus determines which information about its previous occurrences is retrieved, favoring recent information after short temporal delays and frequent information after longer delays. In this research, we tested whether EC follows the same retrieval principles. Initial evidence in favor of this account was based on a modified EC procedure that included CS ratings during learning. In the present studies, we changed the procedure back to a traditional EC procedure without CS ratings during learning. We found that EC reflected the valence of the most recently paired valence, but not of the most frequently paired valence, when measured shortly after a pairing. Conversely, when measured after a longer temporal interval, EC reflected the most frequently paired valence, but not the most recently paired valence. These results support a role of episodic memory and retrieval in EC. Our research highlights parallels to contingency learning and suggests that episodic memory processes govern various types of learning resulting from stimulus contingencies.

Keywords: Evaluative Conditioning, episodic retrieval, evaluative learning, stimulus-response binding and retrieval

Part I: New Advances in Advice Taking Research: Cognitive, Social, and Algorithmic Perspectives

Monday, March 16, 09:00 - 10:30, HSZ - N9

Chair(s): Maren Mayer¹, Tobias Rebholz²

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When making decisions or providing a judgment, individuals often seek and receive advice from others. They may ask a friend whether or not they should spend their holidays in Japan and how much they should plan to budget for such a stay. Advice taking is typically investigated in a judge-advisor system. The judge provides an initial judgment before being introduced to the advice of the advisor. Afterward, the judge provides their final judgment. In this symposium, we combine advances in advice-taking research, outlining new perspectives for the field. The first contribution demonstrates that individual differences can affect whether and how individuals take advice, and how much these influences have been overlooked. The second contribution presents a meta-analysis on how advice taking varies across different study contexts and designs using a dual hurdle model. The third contribution compares advice taking based on aggregated versus non-aggregated advice from multiple advisors, investigating why aggregated advice is heeded more by judges. The last two contributions focus on advice taking from algorithms. The fourth contribution investigates algorithmic advice demonstrating that without explicit communication advice can shape competition and collaboration among individuals. Finally, the fifth contribution examines algorithmic and hybrid advice combining human and algorithmic advice, demonstrating no algorithm aversion but instead algorithm appreciation.

Keywords: advice taking, dependent judgments, belief updating, algorithm aversion, judge advisor system

The complex link of narcissism and advice taking

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The Judge-Advisor System (JAS) is a standardized paradigm to study advice taking. By now, we have a rather good understanding of how advice taking in the JAS is affected by characteristics of the advisor or characteristics of the advice itself. In contrast, knowledge about how the personality of the judge relates to advice taking is still limited. One of the few personality variables that has been shown to correlate with advice taking is narcissism: People higher in narcissism heed advice less, but this effect tends to be small. In individual studies, it often emerges only after controlling for participants' extraversion, and a recent meta-analysis estimated the effect size at $r = -0.12$. One possibly explanation for the small effects is that previous studies relied on outdated conceptualizations that treat narcissism as a monolithic construct. Therefore, we studied the link between narcissism and advice taking using a more recent 3-factor model of narcissism comprised of antagonistic, grandiose, vulnerable narcissism. In two studies, we found that vulnerable narcissism was positively linked to advice taking whereas grandiose narcissism had no systematic effects. Antagonism was not significantly related to advice taking when the degree of advice taking remained confidential, but a negative correlation emerged when the degree of advice taking was made transparent to the advisors. Our findings highlight the relevance of sensible operationalization's and the moderating role of contextual influences when studying the personality-advice-taking link.

Keywords: social influence, advice taking, judgement, individual differences, narcissism

When and Why Advice-Taking Strategies Differ: A Dual Hurdle-Based Meta-Analysis

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Advice taking experiments often utilize a judge advisor system (JAS), where a judge expresses a prior belief, receives advice, and then is allowed to revise their judgment. The degree to which participants revise their judgement is examined via a continuous metric called Weight of Advice (WOA), which defines the revised judgment as a weighted average of the prior and advice. However, even though WOA is continuous, results consistently demonstrate people frequently make discrete choices between their prior and the advice rather than continuously average. We report the results of a meta-analysis on a dataset of over 100,000 observations from 49 JAS studies that employs a recent modeling framework that explicitly distinguishes between these choosing and averaging strategies. This model separates the decision process into an initial discrete choice between decline ($WOA = 0$), adopt ($WOA = 1$), and compromise ($0 < WOA < 1$) and then a continuous averaging judgment in cases where compromise is chosen. While we do indeed find compromising is the dominant strategy, there is high heterogeneity across both studies and participants. In some studies there is a reversal, and advice is compromised with less often than it is declined. We also find participants tend to fully adopt advice at a relatively low rate. Our approach sheds new light on how different moderators, situational contexts, and even study design choices influence the advice-taking process.

Keywords: Advice taking, meta-analysis, Bayesian modeling, decision making, belief updating

To Aggregate or Not to Aggregate: Why Judges Heed Aggregated Advice From Multiple Advisors More

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When receiving advice from multiple advisors, judges tend to rely more on aggregated advice (e.g., the mean of several estimates) than on non-aggregated advice (e.g., multiple individual estimates). The present work investigates why aggregated advice is heeded more strongly in judgment processes. Study 1 ($N = 280$) aimed to replicate the effect of advice presentation format and tested a proposed explanatory mechanism. We hypothesized that judges underestimate the diversity of advisors' opinions when receiving aggregated advice, which leads them to perceive aggregated advice as a stronger signal for adjustment. In a between-subjects design, participants received either aggregated or non-aggregated advice and, orthogonally, information about the actual range of advisors' estimates. Results replicated the higher utilization of aggregated advice and confirmed that the effect was attenuated when the range of opinions was explicitly displayed. Study 2 ($N = 284$) examined this proposed mechanism directly by testing whether the underestimation of advisors' range of opinions mediates the increased use of aggregated advice. In a within-subjects design, participants received both aggregated and non-aggregated advice across several numerical judgment tasks. They additionally estimated the range of advisors' opinions after aggregated trials. Analyses confirmed higher advice taking and a significant underestimation of the actual range for aggregated advice. Together, these studies advance our understanding of cognitive processes in advice utilization and highlight how the perceived diversity of advisors' opinions shapes the integration of multiple social inputs in judgment and decision-making.

Keywords: advice taking, judge-advisor, multiple advisors, aggregated advice

Strategic Algorithmic Advice Taking

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As algorithms increasingly mediate competitive decision-making, their influence extends beyond individual outcomes to shaping strategic market dynamics. In two preregistered experiments, we examined how algorithmic advice affects human behavior in classic economic games with unique, non-collusive, and analytically traceable equilibria. In Experiment 1 ($N = 107$), participants played a Bertrand price competition with individualized or collective algorithmic recommendations. Initially, collusively upward-biased advice increased prices, particularly when individualized, but prices gradually converged toward equilibrium over the course of the experiment. However, participants avoided setting prices above the algorithm's recommendation throughout the experiment, suggesting that advice served as a soft upper bound for acceptable prices. In Experiment 2 ($N = 129$), participants played a Cournot quantity competition with equilibrium-aligned or strategically biased algorithmic recommendations. Here, individualized equilibrium advice supported stable convergence, whereas collusively downward-biased advice led to sustained underproduction and supracompetitive profits—hallmarks of tacit collusion. In both experiments, participants responded more strongly and consistently to individualized advice than collective advice, potentially due to greater perceived ownership of the former. These findings demonstrate that algorithmic advice can function as a strategic signal, shaping coordination even without explicit communication. The results echo real-world concerns about algorithmic collusion and underscore the need for careful design and oversight of algorithmic decision-support systems in competitive environments.

Keywords: algorithmic advice taking, collusion, Bertrand price competition, Cournot quantity competition, strategic decision-making

Algorithm appreciation rather than aversion in judge-advisor-systems

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In this paper, we demonstrate that people are less likely to discount advice that they believe originates from an algorithm rather than from a human. We set out to test the idea that algorithm aversion can be ameliorated by using hybrid advice, a combination of human and algorithmic advice. However, in two preregistered and well-powered studies, we failed to replicate algorithm aversion despite creating the exact conditions under which it should occur, namely when providing participants with performance feedback showing that the algorithm is good but not perfect. In both studies, we presented participants with identical advice but manipulated the label of the advisor depending on the condition that they were allocated to. Contrary to our expectations, hybrid advice was not weighted more than algorithmic advice, and this holds across different ways to operationalise hybrid advice. Together our studies suggest that algorithm appreciation dominates the Judge-Advisor-System (JAS), and that people discount the same advice less as soon as they believe it to be at least partially generated by an algorithm.

Keywords: Algorithm aversion, algorithm appreciation, judge advisor system, advice taking, hybrid advice

Part I: Negation Processing: Interpretation, Mechanisms and Effects

Monday, March 16, 09:00 - 10:30, HSZ - 7E02

Chair(s): Elena Albu¹, Francesca Capuano¹

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Negation has long been a central topic in psychology, linguistics and the cognitive sciences with interest in its nature and functions continuing to grow. Understanding negation is cognitively demanding: negative sentences are often associated with higher processing costs and error rates. A prominent view holds that comprehending negation involves representing two mental models - the negated situation and the actual one - and selectively inhibiting the former. Despite the early emergence of no in children's vocabularies, full mastery of sentential negation develops relatively late. Beyond its role as a logical operator, negation serves diverse discourse functions, from denying plausible assumptions to correcting misinformation. While negation is a linguistic universal, its realization varies substantially across languages, and the processing consequences of these differences remain underexplored. Moreover, the influence of negation extends beyond language, shaping memory, attitudes, and behavior. Part I of this double symposium examines how negation is typically interpreted, which mechanisms are engaged, and how these processes play out cross-linguistically. Elena Albu asks how negation interacts with relative adjectives (Is a boy who is not short of medium height - or tall?). Claudia Maienborn and Frauke Buscher use denial contexts to contrast rejections of world-knowledge violations with rejections of semantic violations. Mechteld Van den Hoek Ostende probes whether inhibitory control is routinely recruited by studying children with ADHD, who often show difficulties with inhibition. Daniel Maurer employs negated cues in a spatial cueing paradigm to test whether comprehenders can orient directly to the actual facts or must first activate - and then inhibit - the negated alternative. Finally, Svetlana Mnogogreshnova compares Spanish and German, asking whether the earlier placement of the negation marker in Spanish relative to German modulates the mechanisms engaged during processing.

Keywords: Negation Processing, Cross-Linguistic Studies, Sentence Processing, Inhibitory Control, Language Acquisition, Executive Functions, Attitude Formation

How tall is a boy who isn't short? Evidence from a picture selection task

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Relative adjectives yield distinct interpretations under negation depending on their polarity (Horn, 1989; Colston, 1999; Ruytenbeek et al., 2017; Tessler & Franke, 2019; Gotzner & Mazzarella, 2021; Gotzner & Kiziltan, 2022). Negating positive adjectives (i.e., not tall), typically results in strengthened to the antonym interpretations (i.e., rather short), whereas negating negative adjectives (i.e., not short) gives rise to middling interpretations (i.e., neither tall nor short). In a series of studies, we investigate whether the observed polarity asymmetry generalizes across a broader range of adjective pairs and different linguistic structures. In Study 1, we assessed the polarity of 54 pairs of adjectives in a picture-selection task, where affirmative and negative sentences (i.e., John is (not) tall / short) were presented together with three different pictures, depicting a tall boy, a short boy and a boy that is neither tall nor short, respectively. The results revealed that, for affirmative sentences, participants chose the pictures matching the adjective for most adjectives. For negative sentences, they predominantly chose the picture depicting the opposite state, regardless of adjective polarity. This pattern suggests that the adjectives were largely assessed as positive. However, it is possible that participants relied on task-specific strategies rather than focusing on the actual interpretation of the adjectives. To address this, we are currently running a follow-up study with instructions designed to directly probe the interpretations of the negated relative adjectives and to assess more accurately their polarity.

Keywords: relative adjectives, negation, interpretive asymmetry, negative strengthening, middling interpretation

When Negation Fails: Diagnosing Semantic vs. World Knowledge Violations

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A longstanding challenge across linguistics, philosophy, and cognitive psychology is to delineate the boundary between semantic anomaly (e.g., Vaccinations are square) and conflicts with general world knowledge (e.g., CDs are square). Both yield deviant statements, but only the former reflects a failure of linguistic composition rather than a clash with experience. Our focus lies on selectional restrictions as instances of semantic knowledge that define the range of conceptually compatible arguments a predicate can combine with. We present a novel approach that examines how such restrictions interact with negation, from which we derive two reliable diagnostics for distinguishing between semantic and world knowledge violations: the FALSUM Test, extending Repp's (2013) analysis of denial (illocutionary negation), and the Wait-a-Minute! (WAM) Test, building on von Fintel (2004). Our central claim is that only world knowledge violations, not semantic ones, can be coherently rejected by denial or standard WAM responses. We present two judgment studies supporting this view. In Study I (Sentential Negation), only world knowledge violations were rendered acceptable under negation, suggesting that negation presupposes semantic well-formedness. In Study II (WAM), world knowledge violations were rejected by standard WAM, whereas semantic violations required a stronger WAM version. Together, these findings provide converging empirical evidence for two diagnostics that remain robust even for difficult or disputed cases. They advance a linguistically grounded account of how semantic well-formedness constrains the processing of negation and the rejection of claims in discourse, and they represent a promising step toward delineating semantic anomaly.

Keywords: semantic anomaly, semantic vs. world knowledge violations, negation, denial, selectional restrictions

Temporal dynamics of negated spatial cueing

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Human processing of negation is typically slower and less efficient than processing of affirmative information, yet the underlying mechanisms remain contested. Some accounts propose that negation may trigger direct access to the intended alternative (“not left” → “right”), while others entail a two-step process in which the negated concept is first activated and then competes with the intended meaning. A third possibility is that negation processing relies mainly on inhibitory mechanisms. In the present experiments, we employed a four-location spatial cueing task to contrast affirmative cues (e.g., “left”) with negated cues (e.g., “not right”). Targets appeared at one of four positions (left, right, top, bottom), enabling classification of trials as valid, neutral, or cue-opposite relative to the cue’s implied direction. We manipulated the cue-target interval across a range of short and medium intervals. Across two experiments ($N = 50$; $N = 55$), negated cues produced enhanced target detection at both the indicated location and at the cue-opposite position, consistent with a two-step model of negation processing. These effects parallel findings from counter-predictive cueing and suggest shared underlying mechanisms that may involve top-down meaning construction processes.

Keywords: attentional orienting, negated cueing, selective attention, negation processing, spatial cueing

Format Matters: Negation Processing in ADHD and Neurotypical Children Across Linguistic and Visual Domains

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Negation comprehension relies heavily on executive functions, particularly inhibitory control. Negated instructions (e.g., “Don’t cross the street!”) are associated with slower, more effortful processing and a higher likelihood of errors. In adults, these difficulties can be reduced when negations are presented in pictorial rather than verbal form. However, it remains unclear whether children benefit from pictorial negations in the same way. In the current study, we investigated this question in children with ADHD—who typically show reduced inhibitory control ($n = 47$)—and neurotypical peers ($n = 48$). Across two preregistered experiments, participants completed tasks designed to measure negation processing. Experiment 1 contrasted fully linguistic versus fully pictorial formats in a reaction time task. Experiment 2 used a mouse-tracking task to compare a fully linguistic format with a mixed format, where children had to integrate pictorial and linguistic information. Results showed that negation processing was effortful for both neurotypical children and children with ADHD. Importantly, pictorial formats supported children’s performance, but only when no integration with linguistic information was required. These findings highlight that negations should be avoided in instructional contexts wherever possible. When unavoidable, pictorial formats—if used alone—may help reduce processing demands. This has practical implications for teachers, clinicians, and caregivers seeking to provide clear, accessible instructions to children in general, but also those with an ADHD diagnosis.

Keywords: ADHD, negation, modality

Understanding and remembering negative sentences across Spanish and German

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Negative sentences are usually harder to comprehend and remember than affirmative sentences, but it is unclear whether the linear position of the negator and its pragmatic licensing influence negation processing and memory retention. We conducted 2 experiments with native speakers of Spanish and German – languages with preverbal and postverbal negation, respectively. Participants performed a two-alternative forced-choice picture selection task (2AFC) and a memory test, separated by a distractor task. In the 2AFC task, participants were presented with short stories – either visually (Exp.1) or auditorily (Exp.2) – that ended with an affirmative or a negative sentence, after which they had to choose the picture that fits the story. Despite the presence of a pragmatically licensing context, response times were slower for negative sentences, but there was no evidence of differential processing costs between Spanish and German. In the memory test, participants were presented with verbal phrases representing either actions that had been encountered in the 2AFC task in an affirmative or a negative target sentence, or fillers representing actions that had not been mentioned before. Participants had to determine whether the action had taken place in the stories in the 2AFC task. The results showed that probes mentioned in negative sentences caused longer reaction times and higher error rates than the affirmative and the filler conditions, consistent with worse memory retention. We conclude that negative utterances, although pragmatically licensed, were still harder to process and more difficult to remember than affirmative utterances across languages.

Keywords: negation, comprehension, memory, recognition, German, Spanish

Narrative Architecture Across Domains

Monday, March 16, 09:00 - 10:30, C-Building - N14

Chair(s): Gabriella Daroczy¹, Freideriki Tselekidou²

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Narrative is not just a way to package information; it is cognitive infrastructure with its specific architecture. This symposium, spanning five perspectives, shows how narrative architecture shapes thinking across contexts. The first talk investigates how narrative competence supports mathematics, especially word problems. An online adult study linked narrative skills to performance (reaction time and accuracy) across problem types, including carry/borrow operations and tasks that varied number relevance. This points to cross-domain links between narrative skill and math problem-solving. The second talk shows how early oral narrative macrostructure predicts later reading comprehension, with strong evidence in Greek-German bilingual learners. The results align with models like the Simple View of Reading and stress the value of early narrative abilities for later literacy. The third talk explores how coherence relations connect parts of a text and guide meaning making. Interpretations of the same relation can shift with language and cultural perspective. Using an annotation-based approach across originals and translations, the work maps these differences and explores computational models to capture them. The fourth talk shows how literary reading may be shaped not only by text-internal features (language use, themes) but also by extrinsic cues, i.e. paratextual information such as signals of a work's canonical status. An online study shows how paratextual cues about a novel excerpt's literary quality (Booker Prize nomination vs. none displayed on the cover) influence story perception, reading experience, and text processing. The fifth talk examines the effect of narrative structure on revising mental models after corrections (debunking effect) versus sticking to misinformation (continued influence effect). Study 1 varied psychological distance (Germany vs. another continent) and emotional valence (positive vs. negative); Study 2 varied correction design, testing whether including and ordering explanations (why the misinformation is false) impacts debunking. To sum up, across these studies, narrative appears as a basic mental tool across domains that selects what matters, links ideas, and guides belief updating. From math to bilingual literacy, from cross-linguistic interpretation to paratext effects and misinformation correction, the common message is clear: shaping narrative structures and cues can meaningfully steer learning, comprehension, and reasoning.

Keywords: narrative architecture, math word-problem solving, bilingual literacy development, coherence relations (cross-linguistic), paratextual cues in literary reading, debunking vs. continued influence

Adult Narrative Skills and Their Links to Math Word Problem Solving

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This talk examines how narrative competence influences mathematical problem-solving, focusing on word problems. While mathematical skills are widely recognized as essential, narrative abilities may be equally crucial for problem-solving. Yet their connection to mathematics remains underexplored. We report an online pilot study with 152 adults that assessed narrative quality using multiple measures of narrative skills and measured mathematical performance across word-problem types that manipulated carry/borrow operations and the relevance of numerical information. Accuracy showed main effects: participants were less accurate on number-relevant than number-irrelevant problems, and higher narrative skill predicted higher accuracy overall. On the other hand, response-time results were more nuanced: there was no reliable main effect of narrative skill, but we observed a robust carry/borrow $\times$ number-relevance interaction. Carry problems were faster than no-carry problems, whereas within number-irrelevant trials the pattern reversed. Moreover, mixed-effects models with random intercepts for participant and trial substantially improved fit. Together, these preliminary findings indicate that narrative skills supports the accuracy of mathematical word-problem solving more than response time. Our analysis indicate that stronger narrative skills predict faster and more accurate performance across these task categories, suggesting shared cognitive processes. These results align with emerging evidence linking language and mathematical problem solving.

Keywords: narrative skill, macro level analysis, adults, word problem solving

Linking Narrative Macrostructure to Later Reading Comprehension in Greek-German Bilingual Children

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Background: Narrative skills are foundational for later literacy because they bridge oral and written language and involve higher-level abilities such as organizing story structure, establishing causal links, and making inferences. However, evidence on how oral narratives contribute to reading comprehension remains limited, particularly for bilingual children in non-English language contexts.

Purpose: This longitudinal study examined whether narrative production and comprehension in Grade 1 predict reading comprehension in Grade 2 in second language (L2) German bilinguals. We further asked whether these associations remain after controlling for vocabulary and reading fluency.

Methods: Sixty Greek-German bilinguals were recruited at the end of Grade 1 ($M_{age} = 7;2$, $SD = 0;5$) and followed until Grade 2 ($M_{age} = 8;2$, $SD = 0;4$). In Grade 1, children produced picture-based narratives and completed narrative comprehension tasks using the Multilingual Assessment Instrument for Narratives (MAIN; Gagarina et al., 2012/2019). Macrostructure scores were derived for production and comprehension based on the MAIN protocol. Expressive vocabulary was also assessed. In Grade 2, children completed standardized measures of reading fluency and reading comprehension. **Results:** Narrative macrostructure in comprehension predicted reading comprehension over and above vocabulary and reading fluency. No significant associations emerged between narrative macrostructure production and reading comprehension.

Discussion: Findings highlight the role of early narrative as a unique predictor of later reading comprehension in bilinguals with L2 German, even when accounting for vocabulary and reading fluency. These results underscore the value of narrative-based assessments in early education, with narrative skills serving as early markers of later reading comprehension.

Keywords: narrative macrostructure, reading comprehension, bilingual children, longitudinal study

Narrative Coherence Through Multiple Perspectives

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Understanding how readers construct meaning from text requires accounting for the coherence relations that link discourse segments. Yet the interpretation of these relations is shaped by the reader's own perspective. In this talk, I present perspectivist analyses of coherence interpretation based on two complementary methodologies: linguistic annotation and computational modeling. Drawing on annotation studies across translations, I show how translational choices introduce additional layers of interpretive nuance and highlight cross-linguistic variation in coherence perception. I then turn to computational models designed to capture individual perspectives on discourse relation recognition, leveraging multi-annotator data collected through crowdsourcing. Together, these findings reveal the variability inherent in discourse coherence and point toward individuality-aware reader models that can more faithfully represent narrative processing across domains.

Keywords: discourse, coherence, annotation, translation, computational modelling, perspective

Don't judge a book by its cover? The effect of paratextual information on the perception, experience, and processing of stories

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Some theories assume that literary reading can be prompted not only by text-intrinsic characteristics (e.g. language used, themes), but also by extrinsic indication, i.e. paratextual information about, for example, the significance of the work for the literary canon (Koopman & Hakemulder, 2015). In an online study, we investigated whether paratextual information about the literary quality of a novel excerpt (nomination for the Booker Prize (high literary merit) vs. no such nomination displayed on the book cover (low literary merit)) influences story perception, experience and text processing. Participants read excerpts from three novels (Glory by NoViolet Bulawayo, 2022; Orbital by Samantha Harvey, 2023; The Shadow King by Maaza Mengiste, 2019) in random order. Which paratextual information they received by means of the manipulated book covers was determined between subjects. After reading, we assessed the perception of literary quality and foregrounding (Koopman, 2015), transportation via the Story-World Absorption Scale (Kuijpers et al., 2014), perceived (self-)reflection after reading, and a recognition task in which literal quotations from the text had to be identified in contrast to paraphrases and distractors (derived from Zwaan, 1994). We assume that paratextual information indicating high literary merit will invite participants to engage in literary reading, which should result in heightened perception of literary qualities of the stories, higher perceived (self-)reflection, and better memory for text surface information. We will also explore possible effects of paratextual information on transportation. The online study is currently still ongoing, but should be completed and evaluated by the time of the conference.

Keywords: paratextual information, literariness, narrative experience

Correction of misinformation as a function of narrative text structure

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We examined the extent to which recipients of narrative text revise their mental models (debunking effect) or stick to misinformation (continued influence effect, CIE) after its correction. These effects were measured using a rating scale on inference statements (= items) that are either compatible or incompatible with the corrected misinformation.

Study 1 (229 participants, 32 items) tested the CIE following the structural integration of corrections in narrative text (immediate refutation of misinformation), compared to its non-integration (delayed correction message). As expected, the CIE is higher in delayed compared to immediate corrections. In Experiment 1, this effect is moderated by emotional valence, with negative, but not positive misinformation increasing the CIE in immediate, but less so in delayed correction. When misinformation is emotionally neutral (Experiment 2), the psychological distance of the described events acts as a moderator. Accordingly, there is a relative increase in CIE when psychological distance is high and correction is immediate. In Study 2 (302 participants, 60 items), we investigated how the structure of correction messages (as suggested in the Debunking Handbook; Lewandowsky et al., 2020; doi:10.17910/b7.1182) modulates the debunking effect. The debunking effect is higher when the misinformation is presented first, compared to a “sandwich” structure with the misinformation placed between facts. Debunking effects of longer correction messages are higher than those of shorter ones that summarize these, but lower than those of shorter messages that leave out the explanation why the misinformation is wrong. These findings are in conflict with some of the Debunking Handbook’s suggestions.

Keywords: continued influence effect, debunking, misinformation, negativity bias, psychological distance

Experimental Engineering Psychology and Human Factors

Monday, March 16, 11:00 - 12:30, HSZ - N1

Chair(s): Stefan Brandenburg¹, Martin Baumann²

¹Chemnitz University of Technology, Germany

²Ulm University, Germany

The facilitated integration of technology into people's lives highlights the importance of examining its impact on experience and behavior. Experimental approaches help to determine the underlying psychological processes of this impact. This symposium summarizes experimental studies examining various contexts of technology use and psychological aspects of Engineering Psychology and Human Factors. Applying various experimental approaches these talks address major concepts of Engineering Psychology and Human Factors, such as situation awareness, cognitive load, technology adaptation in classical domains such as human-AI interaction, human-automation interaction, teleoperation, and highlight the value and the feasibility of rigorous experimental approaches also in complex and applied settings. The first talk by Alexander Reisinger examines how much lead time remote drivers need to effectively regain situation awareness and safely take control of highly automated vehicles during event-based remote driving tasks, highlighting the benefits of providing augmented visual information from the vehicle. The second talk by Andreas Schrank explores how different camera perspectives and visual augmentations influence remote assistants' performance and situation awareness when supervising highly automated vehicles, showing that the optimal perspective depends on the driving scenario and that augmentation can compensate for poor visibility in adverse weather. The third talk by Matthias Arend introduces and validated a new implicit measure of situation awareness called SAMBA, comparing it with established explicit methods and showing that combining SAMBA with the traditional SAGAT approach can provide a more comprehensive and less intrusive assessment of operator awareness during teleoperation tasks. The fourth talk by Romy Müller examines how people evaluate AI image classifications using concept-based explainable AI, showing that participants preferred explanations with image snippets that precisely matched the original image and rated generalized or imprecise explanations significantly lower—indicating that users value precision over robustness in AI interpretations. The fifth talk by Judith Josupeit highlights the benefits of using virtual reality (VR) for rigorous experimental manipulations in applied contexts. In addition, the talk demonstrates how AI can be used in VR-experiments.

Keywords: Highly automated driving, situation awareness, explainable artificial intelligence, virtual reality

Investigating the Time Required by Remote Drivers to get into the Loop During Event-based Takeovers

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Future traffic is expected to be shaped by Highly Automated Vehicles (HAV; SAE Level 4), which promise a wide range of benefits. However, achieving these benefits depends on overcoming traffic situations that are beyond the current technological capabilities of HAVs. Here, one approach could be to issue a take-over request to a remote driver (RD). In these events, the RD proceeds to take over the dynamic driving task for the HAV remotely. This leads to challenges in getting the RD into a state of “being in the loop” (i.e., gaining situation awareness and subsequently taking control without being physically present on site). These challenges can lead to potentially safety-critical RD task performance impairments. To date, this novel challenge has been largely unexplored. To address this gap, we propose to provide the RD with information about the evolvement of the traffic situation, continuously gathered by the HAV. In addition, augmenting the video stream with sensory data gathered by the HAV could further support the RD. In an experimental user study in a simulator setting, we investigated how much Lead Time the RD requires to get into the loop (i.e., to gain situation awareness). $N = 47$ participants encountered typical event-based remote driving tasks displayed in an urban traffic environment, presented either with or without visual augmentation. These tasks were presented with varying Lead Time and traffic situation complexity. Findings contribute to the understanding of how much Lead Time RDs require to enter the loop, thereby increasing safety of event-based remote driving.

Keywords: Remote Driving, OOTL, Situation Awareness, Visual Augmentation

Another Point of View: The Effects of Camera Perspective and Augmentation on the Performance of Remote Assistants of Highly Automated Vehicles

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When operated under real-world conditions, highly automated vehicles (HAVs, SAE Level 4) face many traffic situations they cannot cope with, e.g., adverse weather. Remote assistance may aid HAVs in such situations, making HAV operations more robust. In this task context, human-machine interfaces (HMI) for remote assistants of HAVs often present traffic situations from a camera perspective similar to the driver's. However, this first-person view has been associated with shortcomings including the occlusion of relevant objects on the road or the distortion of distance and angle perception. These shortcomings may affect the performance of the remote assistant. An experimental lab study with 37 participants was carried out to investigate if three different camera perspectives affect performance of remote assistants, their situation awareness, and other variables pertaining to them. The task revolves around determining the point in time when a complex left-turn driving task can be implemented by the supervised HAV at a busy urban intersection with mixed traffic. Additionally, the interplay of camera perspectives and video augmentation that visualizes additional sensor data was investigated in an environment with and without adverse weather due resulting from fog. Results indicated that certain performance indicators including decision time were affected by camera perspective. The positive and compensatory impact of augmentation under poor visibility conditions in adverse weather found in prior studies was replicated. Findings suggest that the most suitable perspective highly depends on the specific scenario. The results will help design context-sensitive HMIs for remote assistance of HAVs.

Keywords: remote operation, highly automated driving, camera perspective

Direct Situation Awareness Measurement Based on Actions

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Operator situation awareness (SA) constitutes a major bottleneck for successful teleoperation. Consequently, many interfaces and support systems are designed with the aim of enhancing it. For evaluating the effects of such systems, SA measures that suit different demands are needed. The present research introduces a novel measure of SA by comparing it with two established measures. The established measures, Situation Awareness Global Assessment Technique (SAGAT) and an adapted Situation Present Assessment Method (aSPAM), are explicit query techniques, whereas the newly developed Situation Awareness Measurement Based on Actions (SAMBA) is an implicit query technique. The comparison was based on the predictive validity and intrusiveness of each measure. Seventy-two participants completed a simulated teleoperation task with high rates of change that required repeated split-second decision-making. SAGAT was most strongly predictive of performance in the teleoperation task. SAMBA showed a medium positive correlation with performance, which explained variance incremental to that explained by SAGAT or aSPAM. In terms of intrusiveness on the primary task, SAMBA showed a smaller carry-over effect than SAGAT, indicating that performance was influenced less. SAGAT, in contrast, was the only measure that did not show dual-task interference. Overall, the results position SAMBA as valid implicit alternative for direct objective measurement of SA that, currently, is exclusively explicit. Furthermore, they underscore the suitability of SAGAT for explicit SA measurement during teleoperation tasks with high rates of change. Combining the explicit and established SAGAT with the implicit and novel SAMBA could help unlock the full potential of both measures.

Keywords: Situation awareness, compatibility effect, behavioral measurement.

The trade-off between precision and robustness in explainable AI: Do people appreciate it when an AI uses generalised concepts?

Romy Müller^{1*}

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What does an AI model actually see in an image it classifies? Concept-based explainable AI (C-XAI) can reveal this by presenting image snippets from the dataset that, according to the AI, resemble the classified image. While C-XAI evaluations typically aim for these snippets to be as coherent as possible, AI systems should also be robust. Thus, some generalisation is desirable. However, do people appreciate this, given the inevitable trade-off between coherence and generalisation? If so, generalisation should lead to high ratings of AI performance, given that the meaning of the image is retained. In the present study, participants rated an AI that classified images of railway trespassers as dangerous or not. The images varied in a relevant feature (a person's relation to the tracks) and a less relevant feature (i.e., a person's specific action). Participants saw C-XAI explanations consisting of snippets in different conditions: the snippets precisely matched the original image (i.e., same action, same relation to tracks), generalised over the relevant feature (i.e., randomised relations to tracks), generalised over the less relevant feature (i.e., randomised actions), or systematically got the less relevant feature wrong (i.e., consistent but different action). Participants rated the AI highest when snippets closely matched the original image. While they strongly dispreferred generalisations over the relevant feature, they rated generalisations over the less relevant feature lower than precise matches, and as low as systematic mistakes. These findings suggest that people may not always favour robustness, but instead expect AI systems to be maximally precise.

Keywords: explainable artificial intelligence (XAI), generalisation, categorisation

Eye-Tracking in Virtual Reality – Current advances and sustaining challenges

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Using virtual reality (VR) as a research tool offers several advantages: head movements and controller input tracking data can be accessed directly in-game, eliminating the need for additional equipment. It further allows for a high level of reproducibility, controllability, and transparency through open-source code in both applied and basic research. When eye tracking is used, gaze-contingent modification of the scene (e.g., foveated rendering) becomes possible. This talk addresses current advances and sustaining challenges from a practitioner perspective. Eye tracking in VR combined with the vergence information, allows for automatic labelling of areas of interest in the 3D space. With modular and customizable eye tracking hardware, the ideas for applications are augmented. However, the technical limitations in accuracy and precision of state-of-the-art eye tracking software and VR headsets remain challenging. In addition, eye tracking in VR is facing issues (e.g., slippage due to movement artifacts), known from head-mounted eye trackers. Current algorithms try to mitigate the problem with the help of artificial intelligence, reducing the transparency of the data logging.

Keywords: Virtual Reality, Eye Tracking, Research Methods

Artificial Intelligence and Robots - Perceptions of and Interaction With New Technologies

Monday, March 16, 11:00 - 12:30, HSZ - N2

Chair(s): Nadia Said¹

¹University of Tübingen, Germany

The introduction of new technologies has always shaped societies. Artificial intelligence (AI) applications, especially AI chatbots, are already part of everyday human life. Robots - for example in healthcare but also in other service areas - are also becoming more and more common. Generally, perceptions of these new technologies are mixed. Whereas some of them are widely accepted (e.g., use of generative AI tools like ChatGPT or DeepL), others are highly controversial (e.g., use of AI in classrooms or robots as companions in elderly homes). This raises the question of which factors influence human perceptions of and ultimately human interaction with AI and robots? The aim of this symposium is to present novel insights into human-AI and human-robot interaction by taking three different perspectives: (i) how far do social perceptions also extend to robots and how does this influence the interaction with robots?, (ii) what factors shape humans' interaction with generative AI tools and how does such an interaction impact them?, (iii) do people differ in their perception of AI and robots? To provide answers to these questions, the first talk investigates the perception of robots as social actors. More specifically, the talk focuses on how similar robots are perceived to be, for example, to human partners. The second talk then tackles the question whether established social heuristics (such as the bystander effect) govern human behavior toward robots. Moving from embodied artificial actors to generative AI tools, the third talk focuses on the influence of external factors (explainability, content, culture) on the perception of an AI chatbot. The fourth talk investigates factors influencing the choice to use generative AI as a cognitive offloading tool and its consequences for human memory and performance. In the final talk, the question of whether Artificial Intelligence and robots are perceived differently is discussed. Jointly, these talks provide a broad overview of human-AI and human-robot interaction by examining the topic from different perspectives.

Keywords: Artificial Intelligence, robots, HRI, bystander effect, cross-cultural comparison, mental models

Perception of Human-Robot Relationships: Professional, Communicative, Impersonal and Emotionless

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Humans tend to ascribe social qualities not only to other people but also to non-human entities such as pets, toys, and robots. The present study examined how individuals distinguish between five types of relationship partners—a familiar person, a professional person, a pet, a cuddly toy, and a social robot—across three everyday contexts: caregiving, conversation, and leisure. Applying the Repertory Grid Method, 103 participants generated 811 construct pairs, which were grouped into seven psychological dimensions: Verbal Communication, Assistance and Competences, Liveness and Humanity, Emotional and Empathic Ability, Autonomy and Voluntariness, Trust and Closeness, and Physical Activity and Responsiveness. Cluster analyses showed that in Verbal Communication and Assistance and Competences, robots were perceived comparably to human partners. In contrast, for Liveness and Humanity as well as Emotional and Empathic Ability, humans clustered together with pets and were clearly separated from robots and cuddly toys, indicating that robots are perceived as less animate and emotionally expressive. For Autonomy and Voluntariness and Trust and Closeness, robots aligned with professional humans, while familiar persons, pets, and cuddly toys formed a separate cluster. These results point to a dual perception of social robots: efficient collaborators on the one hand, but emotionally limited and socially constrained on the other. Identifying the underlying psychological dimensions of these perceptions advances the understanding of how people construct sociality, animacy, and emotional closeness in interactions with non-human agents.

Keywords: Human-Robot Interaction, Human-Robot Relationship, Human-Robot Bonding, Human-Pet Interaction, Social Robotics, Repertory Grid

The Bystander Effect in Human-Robot Interaction: How the Presence of Bystanders Inhibits Help for a Social Robot

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As humans and social robots increasingly coexist, a crucial question remains: Do established social heuristics (such as the bystander effect) govern human behavior toward robots? Through two pre-registered experiments ($N = 401$ and $N = 616$), we demonstrate that the presence of bystanders consistently inhibits helping behavior toward robots in human-robot interaction (HRI), mirroring classic findings in human-human interaction. In Experiment 1, we found that when bystanders were present, individuals were less likely to help a social robot in need than if they were alone. In Experiment 2, we used video stimuli with higher ecological validity and incorporated a human victim as a control group, generalizing this effect and revealing its robust stability. While the presence of bystanders generally inhibited helping intentions (regardless of whether the victim was human or robot), the strength of the bystander effect did not differ between human and robot victims. These findings provide the first empirical evidence that the bystander effect can be replicated in human-robot interaction (HRI). Our work contributes to the extension of the application boundaries of the bystander effect and the construction of a harmonious human-robot symbiotic society.

Keywords: bystander effect, helping behavior, human-robot interaction, social robot

The Influence of Content and Explainability on the Perception of the AI Chatbot „ExplainitAI“ in a Cross-Cultural comparison between Germany and South Korea

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In our study, we investigated whether the perception of an Artificial Intelligence (AI)-driven ChatBot (based on the large language model GPT-4) differs between Germany and South Korea. Furthermore, we investigated possible topic dependencies of AI perception and explored the impact of varying one dimension of explainability, namely "contextual information." To this end, we collected two quota-based samples from Germany and South Korea with a total of $N = 297$ participants. Results showed significant differences between German and Korean participants in their perceptions of AI. More specifically, Korean participants displayed higher trust, expressed more positive user experiences, and perceived AI as more of an opportunity compared to German participants. Furthermore, we showed that the content provided by the AI influenced participants' trust in AI. That is, participants reported lower trust in AI for societally debated topics (e.g., migration) compared to health or entertainment topics. Additionally, interactions between countries, content provided by the AI, and explainability conditions further shaped participants' perceptions, highlighting the interplay of cultural, contextual, and content-specific factors in AI evaluation. These results emphasize the importance of integrating cultural and contextual nuances into the design of AI systems, offering actionable insights for the development of culturally adaptive and explainable AI tailored to diverse user needs and expectations across domains.

Keywords: artificial intelligence, ChatBot, cross-cultural comparison, trust, explainability, risk-opportunity perception

Cognitive Offloading with Generative AI: User Choice and Consequences for Task Performance and Memory

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This talk investigates human interaction with generative AI (i.e., chatbots) from the perspective of cognitive offloading. We present two experiments examining (1) the factors influencing the decision to offload cognitive tasks to AI and (2) the consequences of such offloading on task performance and memory. The first experiment focused on choice factors. Participants could solve arithmetic word problems internally or offload them to a chatbot. We manipulated the bot's response speed and measured participants' math skill. Results revealed that bot speed influenced offloading decisions: participants offloaded more frequently to a faster bot. Furthermore, higher math skill predicted less reliance on the AI. The second experiment investigated the consequences of chatbot use on tasks targeting two levels of Bloom's taxonomy: 'apply' and 'remember'. Participants completed text comprehension problems, randomly assigned to either use a chatbot or work unaided. Results showed that while chatbot use did not significantly alter performance on 'apply' tasks, it significantly impaired subsequent memory for the text content. Taken together, these findings demonstrate that the cognitive offloading framework offers a valuable framework for understanding human-AI interaction. This research highlights that both system characteristics (e.g., speed) and user abilities (e.g., skill) shape AI adoption, and that reliance on AI as a cognitive tool can have detrimental effects on later memory performance.

Keywords: Cognitive Offloading, Generative Artificial Intelligence, Bot Speed, Human-AI Interaction, Choice, Memory, Performance

ChatGPT and Machines? Understanding Mental Models and Preferences for AI and Robots in Germany

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In Germany, artificial intelligence (AI) is becoming increasingly integrated into daily life, while the use of robots remains limited. While AI and robots could perform similar tasks in many application areas, they fundamentally differ in that robots have a physical presence, i.e., are embodied, as opposed to AI being an abstract algorithm running in the background of an application. Prior research generally links embodiment with positive user perceptions; however, recent evidence suggests that abstract, non-embodied AI systems are preferred over physically embodied robots. To examine this discrepancy, the present study surveyed a quota-based sample of the German population ($N = 395$). Participants evaluated AI and robots across service, security, and medical contexts providing free word associations used to assess mental models. Results revealed that although robots were, overall, perceived as more embodied and more positive, AI was consistently the preferred technology, particularly in service scenarios where human control is high. Robots were most associated with “Machine,” while AI was strongly linked to “ChatGPT,” indicating the influence of technological trends on public perception. Twelve percent of participants associated AI with “Danger,” representing a technology-skeptical subgroup that was older and had less formal education. These individuals showed no clear preference for AI or robots and tended to view both technologies as risky. Overall, Germans favor abstract AI systems over embodied robots despite more positive attitudes toward the latter. Context sensitivity and societal perceptions of control are crucial for the ethical and effective implementation of AI and robotics in Germany.

Keywords: artificial intelligence, robots, embodiment, risk perception, technology acceptance, Germany

Simon Goes Social: The Impact of Social Task Settings on the Simon Effect

Monday, March 16, 11:00 - 12:30, HSZ - N3

Chair(s): Miriam Gade¹, Pamela Baess²

¹Medical School Berlin, Germany

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The Simon effect - characterized by quicker responses when the location of the imperative stimulus corresponds to the position of the required response - has been recognized for decades (Simon, 1969) and is considered a valuable window into fundamental mechanisms of information processing. Simon effects have been found to vary depending on both spatial arrangement of stimuli and participants' intentions, highlighting that the underlying cognitive processes are flexible and subject to modulation. Traditionally, Simon tasks are administered to individuals working in isolation, which does not reflect the inherently social nature of humans. Therefore, this symposium spotlights the role of social information in modulating the Simon effect. Across four presentations and an integrative discussion, speakers will examine how agency attributions, perspective taking, and the presence of a co-actor influences performance in the Simon task. The findings will illuminate the social foundations of the classic Simon task.

Keywords: spatial compatibility, Simon effect, social, agency, perspective taking

Simon standing upright

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In two experiments we investigated to which degree the Simon effect is reliably altered by spatial layout of the stimuli when using upright standing manikins. Those manikins were holding a ball in either their horizontal dimension (i.e., left or right from their waist) or vertical dimension (above or below their chest). Differential Simon effects have been reported depending on stimulus dimension suggesting less or more reliance on controlled processes. We speculated that agency labels (“me”, “friend” or “colleague”) should increase the recruitment of controlled processes and thus abolish the difference between dimensions. In Experiment 1, the agency label was presented simultaneously with the imperative stimulus, i.e. the ball color, and influenced the Simon effect likewise for both spatial dimensions. The Simon effect, i.e. the difference between congruent and incongruent trials was smallest for the “me” label, and about the same size for the other two labels. However, dimension did not show a main effect suggesting the label overruled the spatial layout of the ball position. Using blank labels that did not include any agency information, Experiment 2 restored the influence of dimension on the congruency effect, yielding smaller congruency effects for the vertical dimension. We speculate that the social labels go along with a generally more controlled processing of the Simon task that does overrule the spatial layout adopted.

Keywords: Simon effect, agency, spatial layout, controlled vs. automatic processing

Social Offloading in the Simon Task: Assigning Distractors to a Partner Reduces Interference

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The Joint Simon task (Sebanz et al., 2003) is typically taken to show a default tendency to track others' actions. We test how dividing task responsibilities modulates interference in the Joint Simon task. In the classic version, partners divide responsibility by assigning responses to one or the other target dimension in a go/no-go fashion. This division typically produces interference from the partner's actions, consistent with the notion of partner co-representation. In contrast, a joint version of a related semantic compatibility task, the picture–word interference (PWI) task, shows that dividing responsibilities across targets and distractors (one person processes targets, the other distractors) can attenuate interference (Kuhlen & Abdel-Rahman, 2022; Tufft & Richardson, 2020). In this study ($N = 48$), we adopted that division-of-labor logic in the Simon task: participants responded to both target mappings while believing a co-actor handled the spatially defined distractors. Assigning responsibility for distractor processing to the partner eliminated the typical Simon interference. We interpret this reduction as social offloading: delegating distractor processing to a partner allows deprioritization of irrelevant spatial codes, facilitating more efficient action selection in distributed settings (cf. Tufft & Richardson, 2020). By reframing the Joint Simon task, we show how dividing responsibilities across partners can reveal when interference is sustained versus alleviated, offering a sharper view of the social foundations of the Simon effect.

Keywords: Joint Simon Task, Social Facilitation, Offloading, Distributed Cognition

Semantics beat perception: Reversal of a Simon-like compatibility effect under conditions of laterality judgments made from a third-person perspective

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Laterality judgments made according to a third-person perspective are easier when this perspective aligns with the perspective of the participant than when the two perspectives are misaligned. This alignment advantage has been attributed to mental perspective transformation (assumed to take place before the judgment is made). In standard perspective taking tasks, alignment of perspectives is confounded, however, with spatial (i.e., left-right) correspondence of the target stimulus feature and the response. To deconfound these factors, we modified the Own Body Transformation Task, which requires laterality judgments of a stimulus feature according to the perspective of a human-like stimulus figure (presented in upright format), by asking participants to give “same-different” rather than “left-right” responses. Specifically, participants judged whether laterality of the feature matched or mismatched the laterality of the feature on a prime figure presented before (i.e., sequential comparison task by pressing a left- vs. a right-sided key. When the target figure was presented in back-facing orientation, a regular Simon effect occurred (i.e., responses were facilitated when the side of the required response corresponded to the side of the target feature). When the stimulus figure was presented in front-facing orientation, however, response performance was better when the laterality of the target feature judged from the figure’s perspective matched (and thus, judged from the participant’s perspective, mismatched) the side of the required response. This reversal of the Simon effect suggests that spatial stimulus-response compatibility is dominated by task-defined semantics (i.e., laterality coding according to a third-person perspective).

Keywords: perspective taking, Simon effect, sequential comparison

Agency goes first: Disentangling the influence of agency labels in horizontal and vertical Simon tasks

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Task-irrelevant spatial information reliably affects response times, as shown by faster reactions when stimulus and response locations are compatible compared to when incompatible. The observed Simon effect offers key insights into response selection mechanisms. While prior research has focused primarily on bottom-up factors modulating the Simon effect, recent studies highlight the impact of top-down information. In our previous work, we combined irrelevant spatial cues (horizontal and vertical position) with agency information superimposed on stick-figure manikins (manikin labels: “me”, “friend”, “colleague”) in a Simon task. Results revealed reduced Simon effects for the “me” label across both orientations. The present study further examines this effect by manipulating the timing of the relevant (color) and irrelevant (agency label) information using jittered intervals (0-200 ms, five steps). In two experiments, agency cues preceded color cues. In a third experiment, the sequence was reversed. When agency information was presented first, Simon effects again were decreased for the “me” label. When color information appeared first, label effects were more subtle, depending on jitter and orientation.

Our findings suggest a robust influence of agency labels on both horizontal and vertical Simon tasks, with temporal jitter differentially affecting the magnitude of Simon effects across orientations. These results support the view that top-down agency cues dynamically interact with the timing of relevant and irrelevant stimulus features, modulating response selection.

Keywords: spatial compatibility, Simon effect, agency, self, cognitive control, spatial layout

Part II: Computational Models of Confidence in Learning and Decision-Making

Monday, March 16, 11:00 - 12:30, HSZ - N4

Chair(s): Sebastian Hellmann¹

¹TU Munich, Germany

A feeling of confidence accompanies most of our decisions - whether we face uncertainty, evaluate risks and rewards, or make repeated choices over time. As research on metacognition expands beyond the domain of isolated perceptual judgments, computational models of confidence are increasingly being applied to dynamic and value-driven contexts, providing new insights into how people monitor and adjust their beliefs across decisions. This symposium brings together recent work that explores how confidence is formed, updated, and used in valuation and learning. The session opens with Robin Vloeberghs who connects the first and second session with a critical perspective on the common assumption that individual decisions are independent. He demonstrates how fluctuations in internal decision criteria systematically influence confidence across repeated choices. Second, Sebastian Hellmann, introduces a computational framework that integrates Cumulative Prospect Theory with an SDT-like confidence model, jointly capturing risky decision making and metacognitive evaluation, thereby connecting valuation under uncertainty with the principles highlighted across the other talks.

Going from description to learning risky outcomes, Rebecca West uses computational modelling to examine how people monitor their uncertainty when generalizing knowledge from learned risky options to unfamiliar ones. She investigates the strategies people use to infer the mean and variance of unknown payoff distributions through similarity-based generalisation, and how they track their own uncertainty in making these inferences. Mean and variability are also key aspects of the context in many other learning paradigms. Alexandre Lietard investigates how confidence adapts to such environmental changes in value-based learning, showing that participants' confidence increases with overall reward magnitudes—even when accuracy does not improve because of higher variability. Going beyond classical reinforcement learning, Florian Scholten explores metacognition as certainty in attitude acquisition. By visualizing trajectories of confidence accompanying binary choices in evaluative probabilistic learning, he detects patterns of uncertainty reduction in forming positive and negative attitudes.

Together, the symposium compiles an integrative picture of how confidence is generated and updated across the domains of valuation, perception, and learning. By combining formal modeling with empirical data, this symposium highlights principles that link decision uncertainty, subjective confidence, and adaptive behavior within a unified computational framework.

Keywords: confidence, metacognition, computational modelling, decision-making, learning

Trial-by-trial fluctuations in decision criterion shape confidence

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Many of the choices we make are accompanied by a sense of confidence. Within classical Signal Detection Theory (SDT), confidence is conceptualized as the absolute distance between a decision variable and a decision criterion. The decision criterion is traditionally modelled as being stable over an experimental session. However, recent work challenges the notion of a static decision criterion, suggesting instead that the criterion undergoes trial-by-trial fluctuations. Combining SDT theory and model simulations, we predict that fluctuations in the decision criterion shape confidence. In 15 human decision-making datasets, trial-by-trial estimates of decision criterion were obtained with the Hierarchical Model for Fluctuations in Criterion (hMFC). Across all datasets, we confirmed our pre-registered hypothesis that confidence is shaped by single-trial criterion state. This effect was found in 14 out of 15 individual datasets, indicating a robust pattern across a variety of task paradigms and confidence reporting scales. Going beyond self-report, the shaping of confidence by criterion fluctuations was replicated in an implicit measure of confidence, RTs, and in two key neurophysiological markers, pupil-linked arousal and a neural signature of confidence. Our results demonstrate that variability in confidence, which has traditionally been treated as noise, actually reflects genuine sensitivity to the current state of the (fluctuating) decision criterion.

Keywords: Decision confidence, Signal Detection Theory, computational modeling, time-varying parameters

Modeling the impact of self-esteem on valuation and metacognition in risky decision making

Sebastian Hellmann^{1*}

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Decision confidence is still predominantly studied in decisions with a clear notion of correctness (e.g., in perceptual and knowledge tasks). However, there is increasing interest in metacognitive judgments in preferential decisions. Risky choices - decisions between monetary lotteries - are a common paradigm in behavioral economics and decision science to investigate how people evaluate different outcomes and risks. Cumulative prospect theory (CPT) is a prominent computational model to describe how people value monetary gambles and deviate from normative behavior. Yet, few studies have examined how confidence judgments in the context of risky choice reflect this valuation. In addition, it is an open question how individual differences in general self-esteem affect the valuation of risky options and trial-level confidence judgments. We predicted that higher self-esteem is associated with a higher tendency to take risks and a generally higher confidence reports. We combined CPT with a signal-detection-based process model, which jointly describes the process generating choice and confidence judgments in a unified computational model. Using this model, we examined the effect of individual differences in self-esteem in the valuation of lotteries and how these differences also explain differences in confidence judgments. The unified CPT-SDT model revealed that the valuation of the gambles was not affected by individual differences in self-esteem. However, the value-independent bias towards risky options and general the tendency to report higher local confidence increased with higher self-esteem. These results illustrate how combining models of valuation and metacognition can help uncover distinct mechanisms linking personality traits, decision-making, and confidence.

Keywords: confidence, metacognition, computational modelling, decision-making, cumulative prospect theory, risky choice

Similarity-Based Generalisation and Confidence in Risky Decision-Making

Rebecca West^{1*}, Thorsten Pachur¹

¹Technical University of Munich, Germany

Confidence judgments reflect people's ability to monitor their own uncertainty, yet little is known about how this monitoring operates when individuals must generalize knowledge from learned risky options to unfamiliar ones. In this study, we examine how people learn the reward structure of risky options, how they generalize this knowledge to novel options, and how their confidence tracks this process. Participants first learn how shape and color correspond to the mean and variance of payoff distributions by repeatedly observing outcomes from nine exemplar distributions. They then make confidence-weighted preference judgements for novel stimuli that vary systematically in similarity to the learned exemplars. Using computational modelling, we estimate similarity-based generalisation functions for both mean and variance information and examine how these inferred beliefs feed into subjective utility and confidence. This approach allows us to test not only how people infer the value of new options from known ones, but also whether generalisation differs across the two statistical dimensions of risky choice. By comparing alternative generalisation functions, we also identify the specific strategies that people use to evaluate unfamiliar options. These findings show how people monitor their own uncertainty when judging novel risky prospects, offering new insights into the computational underpinnings of confidence and generalisation in experience-based choice.

Keywords: confidence, risk, metacognition, generalization

Experimental assessment of the confidence choice-congruent bias in value-based learning

Alexandre Lietard^{1*}, Kobe Desender¹

¹KU Leuven, Belgium

Confidence serves as a crucial internal signal that supports adaptive processes in both learning and decision-making. This feeling reflects the estimated probability of being correct on a decision. In perceptual decision-making, one notable deviation from optimal probability computation, known as the choice-congruent bias, describes the tendency to place higher weight on evidence that favors the chosen option. Consequently, confidence often rises with the overall strength of evidence, even when accuracy does not improve. In this study, we investigated whether a similar bias occurs in value-based learning by testing whether stronger overall evidence leads to higher confidence. Our findings show that increasing the average reward reliably increases confidence levels while leaving accuracy unaffected. Nonetheless, computational modeling suggests that this effect does not necessarily stem from a biased confidence computation. Thus, although manipulating average reward offers a promising approach for separating confidence from accuracy, it may not constitute a direct measure of the choice-congruent bias.

Keywords: Reinforcement learning, confidence, metacognition, choice-congruent bias

Metacognition as certainty: A Cognitive Process Model of Attitude Acquisition

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²University of Basel, Germany

Pairing a neutral conditioned stimuli (CSs) with valenced unconditioned stimuli (USs) or outcomes (valenced experiences with CSs) elicits behavioral responses of liking toward them. This evaluative conditioning effect is typically examined in contingent environments where a CS is paired only with positive or negative USs. However, real-world conditioning of stimuli is rarely univalent, and CSs may be probabilistically paired with combinations of positive, negative, or mixed USs. Pairings are also not always indicative of a stimulus' actual valence: a likable person might live in a crime-ridden area and be consistently paired with negative stimuli without that meaning the person himself should be evaluated negatively. In two experiments (total $N = 223$), we examined the acquisition of attitudes and its underlying uncertainty in probabilistic environments. In 300 trials, participants predicted whether experiences with four companies would be positive or negative based on CS-US pairings of company logos and valenced images. We manipulated the liking and predictability of each company by (mis)matching the valence of CS-US pairings and associated outcomes. Both CS-US pairings and CS-outcome pairings successfully elicited positive or negative evaluation for each CS. Unpredictability led to a decrease in CS valence scores. To illustrate the dynamic development of uncertainty in attitudes depending on the predictability of company experiences, a cognitive process model was developed by analyzing more than 66000 response time and choice data. The parameters of our dynamic diffusion decision model and their trajectories reflect varying pathways of uncertainty reduction in the process of liking and disliking over time.

Keywords: attitudes, dynamic diffusion model, evaluative conditioning, probabilistic learning

Perception & Psychophysics

Monday, March 16, 11:00 - 12:30, HSZ - N5

Chair(s): Volker H. Franz¹, Rolf Ulrich¹

¹University of Tübingen, Germany

We examine recent advances in the psychophysical investigation of cognitive representations and mechanisms. The overarching question is how we can use psychophysical measurement to learn something about the cognitive representations and their functional relevance in the human mind. We will investigate questions in the domains of time and size perception as well as motion prediction and will apply advanced psychophysical methods to these questions. F. Wichmann will give a general overview of how internal visual representations can be estimated. R. Johansson and P. Kelber will present recent work on time perception: R. Johansson will discuss time and intensity judgements, and P. Kelber will present boundary conditions for visual duration discrimination. D. Oberfeld-Twistel will discuss how biases observed in pedestrians' arrival time estimation for approaching vehicles can be captured by a Bayesian observer model. Finally, K. Bhatia will ask what we can learn from visual size discrimination about the cognitive representations underlying the visual guidance of perception and action.

Keywords: perception, time, visual size, motion prediction, action, cognition, representation

Estimating internal visual representations

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Measuring thresholds is an established and time-proven method to obtain the minimal differences required to reliably discriminate stimuli: the just-noticeable difference (JND). However, in perception we are often times not only interested in the JND, but in subjective aspects of perception, for example, in how bright a light appears, or which textured surfaces appear more similar to one another. To obtain answers to such supra-threshold questions we typically employ scaling or magnitude-estimation techniques. With scaling techniques the perceived similarity relations between stimuli are mapped to a geometry, in which the distances in the internal (typically Euclidean) space correspond to the perceived similarities: Stimuli perceived to be similar should be close together in the putative internal representation, whilst stimuli perceived to be dissimilar should be far apart. A number of scaling techniques exist, but in recent years ordinal embedding techniques from machine learning have been successfully used to infer internal representations from ordinal triplet comparisons in psychology. In my presentation I will explain the fundamentals of ordinal embedding techniques and argue that, together with ordinal triplet comparisons, ordinal embedding is a useful and reliable method to infer internal representations. For example, and unlike it is the case for other scaling techniques, for ordinal embeddings we have statistical means to objectively determine the dimensionality of the embedding. In addition, I will show that mathematically similar triplet question variants---"standard" triplets versus odd-one-out---are psychologically not the same.

Keywords: ordinal embedding, scaling methods, statistical modeling, psychophysics, representation, visual perception

The Time-Intensity Uncertainty Principle in Vision

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The relationship between time perception and brightness perception remains poorly understood. We developed a computational model linking the two domains, grounded in established principles of neural information processing in visual cortex. A nonlinear transducer maps luminance to population spike rate, and correlated gain fluctuations impose an upper bound on the achievable signal-to-noise ratio. Perceptual magnitudes in both domains are decoded from the same spike-count statistics, yielding a reciprocal trade-off in perceptual resolution: brighter stimuli improve temporal precision but impair brightness sensitivity, whereas longer stimuli enhance brightness sensitivity but degrade temporal resolution. We tested these predictions in two psychophysical experiments manipulating stimulus duration and luminance. Observed data closely matched model predictions, revealing a fundamental coding limit in vision—the time-intensity uncertainty principle. This limit provides a unified explanation of the mechanisms behind Weber’s law, Bloch’s law, and luminance-dependent shifts in duration thresholds.

Keywords: uncertainty principle, time, brightness, visual psychophysics

Modeling time-to-collision judgments as Bayesian estimation: Speed and distance priors

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When humans predict the arrival time of an object at a designated position in space (i.e. estimate its time-to-collision, TTC), certain biases and characteristics are observed consistently. First, when two objects approaching at different constant speeds have an identical actual TTC, the TTC for the faster object is estimated to be longer than that for the slower object (speed/distance effect). Second, the intraindividual variability of the estimated TTCs increases with the mean estimated TTC (scalar property). Third, short TTCs tend to be overestimated and longer TTCs underestimated (central tendency). Here, we propose a simple Bayesian observer model in which the perceived distance/speed is assumed to be a weighted average of the distance/speed presented in the current trial and a prior determined by the distribution of distances/speeds presented in the experimental session, all processed on a logarithmic scale, with additive Gaussian internal noise. The estimated TTC is set to the ratio of the perceived distance to the perceived speed. We present simulation results and model fits to data from an experiment measuring visual TTC estimation for approaching vehicles in a virtual environment. The results show that both a speed and a distance prior are needed to predict the patterns reported in the literature and observed in the experiment. For the experimental data, the model captures both "molar" (mean estimated TTCs and their intraindividual variability) and "molecular" (cue weights estimated with a reverse-correlation approach) psychophysical results. We conclude that this type of model is a promising approach for predicting human time-to-collision estimation.

Keywords: Bayesian observer model, time-to-collision, motion prediction, priors, traffic scenarios, cue weights

Internal reference updating in visual duration discrimination: A search for boundary conditions

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A growing body of psychophysical research suggests that the comparative judgment of successive stimuli involves more than taking the difference between their sensation magnitudes, challenging traditional difference models, such as signal detection theory. Two elaborated theories assume that each sensation magnitude is weighted by its reference level (sensation weighting model) or that the second sensation magnitude is compared to a dynamically updated internal reference, in which the first sensation magnitude gravitates towards the previous reference level (internal reference model). Whereas both models can explain higher discrimination sensitivity when the standard precedes the comparison (negative Type B effect), only the sensation weighting model can account for higher discrimination sensitivity when the standard follows the comparison (positive Type B effect). Most previous studies reported negative Type B effects, while some positive Type B effects have also been reported, especially for duration discrimination with short stimulus durations and/or short inter-stimulus intervals combined with adaptive-staircase procedures. The presented study systematically searched for positive Type B effects in visual duration discrimination by orthogonally varying stimulus duration (80 versus 500 ms standard), inter-stimulus interval (200 versus 900 ms), and stimulus type (filled versus empty intervals) across four experiments (plus one pilot experiment) using the method of constant stimuli. Type B effects were consistently negative across all experimental conditions and analysis methods. This overall absence of positive Type B effects in visual duration discrimination questions the need for the flexible sensation weighting framework and supports more parsimonious theories of comparative judgment, such as the internal reference model.

Keywords: comparative judgment, duration discrimination, time order error, sensation weighting, internal reference

Size Discrimination in Perception and Action

Kriti Bhatia^{1*}, Tanja Huber¹, Sascha Meyen¹, Frederic Goehringer², Thomas Schenk², Volker H. Franz¹

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Ganel et al. (2012, PLoS One) reported that grasping is more accurate than perceptual judgements in discriminating object size: When they presented participants with objects of slightly different sizes (0.5 mm), participants' grip apertures during grasping accurately reflected this difference, while the accuracy of perceptual judgements (responses: "small" vs. "large") was seemingly low at 59% (close to chance-level 50%). This was considered as further evidence that visual information is differently processed for action versus perception in the dorsal versus ventral cortical streams, respectively (Perception-Action Model); with actions assumed to be more veridical than perception. However, grip apertures cannot be directly compared to perceptual accuracy. Meyen et al. (2022, JEP:G) showed that the same underlying information can lead to a clear separation of the means (as in grasping), yet result in poor classification accuracy (as in perception). To solve this issue, continuous measures (grip apertures) can be dichotomized to calculate a corresponding (grasping) classification accuracy, which can then be compared to the perceptual accuracy. Following this idea, we conducted an improved replication of Ganel et al. (2012) with 48 participants and applied this new analysis. We found that grasping classification accuracy was $52.1 \pm 0.6\%$ while perceptual judgement accuracy was much higher at $66.9 \pm 1.2\%$. We also reanalyzed published results from other studies on size discrimination and obtained consistent results ($53.1 \pm 1.2\%$ in grasping vs. $65.3 \pm 1.3\%$ in perceptual judgement). These results raise doubts about the assumption that grasping is more veridical than perception.

Keywords: action, perception, grasping, size perception, discrimination

Part II: Beyond Advice Taking: How do Others Influence Our Judgments and Beliefs?

Monday, March 16, 11:00 - 12:30, HSZ - N9

Chair(s): Maren Mayer¹, Tobias Rebholz²

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²Fuqua School of Business, Duke University, United States

Beyond the more traditional paradigm of advice taking, which is at the center of the symposium “New advances in advice taking research: Cognitive, social, and algorithmic perspectives”, this symposium highlights paradigms and cases in which dependency among individuals is less structured. In five talks, we present and discuss evidence from paradigms featuring dependent judgments and belief updating and highlight how others influence individuals’ judgments and beliefs in various ways. The first contribution highlights how planned missing data designs can help us measure belief updating when no initial judgment is elicited. The second contribution draws on sequential collaboration, a method for aggregating estimates that does not include initial judgments, and examines whether contributors are influenced by social information about others. The third contribution investigates how framing and repetition of information systematically influence not only subjective truth judgments but also confidence, which in turn has been associated with reduced information seeking. In the fourth contribution, belief updating to scientific hypotheses is compared under different ordering and under either sequential or simultaneous presentation of evidence. Finally, the last contribution examines how trust in science shapes individuals’ belief updating for scientific evidence considering both source expertise and ambiguity of evidence.

Keywords: advice taking, dependent judgments, truth effect, negativity bias, belief updating, science communication

The Effect of Explicit Prior Judgment Elicitation on Belief Change

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In standard judge advisor system (JAS) studies a judge reports a prior belief, receives advice, and then revises their initial estimate, providing a clear and tractable measure of quantitative belief revision. However, what happens if prior beliefs are not elicited? Past research has identified clear differences in posterior beliefs depending on whether priors are elicited or not, implying the mere elicitation of a prior has a treatment-like effect. However, without prior judgments, we are restricted to studying posterior judgments, rather than belief change. We propose a new method that treats judges' priors as planned missing data and employs imputation techniques to generate estimates of those priors, and thus estimates of how their beliefs change, without ever having to ask them to directly report their priors, thereby circumventing this treatment-like effect. We first use simulation studies to demonstrate the feasibility of our method, then apply it in two advice taking experiments. In a calorie estimation task we show judges are both more willing to consider advice and weigh it more heavily when they aren't anchored on an explicit prior. However, in a probability forecasting task, neglecting to elicit a prior induced latent confirmation bias, causing detrimental effects on judgment accuracy.

Keywords: belief updating, computation modeling, missing data, Bayesian methods, advice taking, forecasting, simulation studies

Minimizing social biases in group judgments with sequential collaboration

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Sequential collaboration is a process to elicit dependent individual judgments inspired by large-scale online collaborative projects such as Wikipedia and OpenStreetMap. In this process, entries are created by initial contributors and are adjusted or maintained by subsequent contributors forming a sequential chain of adjusted or maintained entries. Sequential collaboration was adapted to numerical judgment formation showing that judgments are adjusted less over a sequential chain and become increasingly more accurate comparable to aggregating independent judgments (wisdom of crowds). The accuracy of the previous judgment as well as contributors' expertise have been found to be key determinants of whether a previous judgment is adjusted and how accurate this adjustment is. As contributors in sequential collaboration are only informed about the latest judgment in the sequential chain but do not receive any additional information, we examined how information about the previous contributor may affect adjustments in sequential collaboration. In five studies examining previous contributors' expertise, gender and group membership, we did not find any substantial influences over and above contributors' own expertise and the accuracy of the previous judgment. This demonstrates that sequential collaboration seems to be a process that minimizes social biases in group judgments. These results shed light into why online collaborative projects yield highly accurate information by using a bias preventing collaboration method.

Keywords: dependent judgments, anchoring, social influence, advice taking, expertise

Systematic Effects of Framing and Repetition on Subjective Confidence in Truth Judgments

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People are constantly exposed to potentially deceptive information, whether in political campaigns, advertisements, or social media posts. While factors influencing truth judgments have been examined extensively – such as in the context of the illusory truth effect or negativity bias in judgments of truth – the mechanisms shaping people's confidence in these judgments have received far less attention. Yet, understanding this metacognitive aspect is essential, as subjective confidence in judgments affects subsequent information seeking – across various levels of task difficulty and objective accuracy (e.g., Desender et al., 2018). Across several experiments comprising a total of 21,832 individual truth judgments, information repetition ($N = 165$) and framing ($N = 166$) were systematically manipulated while assessing subjective confidence in a naturalistic setting using Instagram-like posts. The results demonstrate that both repetition and framing substantially influence not only immediate truth judgments but also subjective confidence in these evaluations. In sum, these findings suggest that (dis-)information strategies employing such techniques not only shape short-term perceptions of truth but may also be particularly resistant to attempts at correction.

Keywords: Truth judgments, Subjective confidence, Illusory truth effect, Negativity Bias, Framing, Repetition, Metacognition

Effects of Scientific Evidence Presentation Formats Point to a Memory-Sampling Mechanism in Evidence-Based Belief Updating

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The aim of the scientific enterprise is to foster the accumulation of a reliable body of knowledge on which we can base our beliefs about the world. This typically entails the synthesis of different pieces of evidence obtained in individual scientific studies. We investigated the impact of different evidence presentation formats on laypeople's belief updating regarding psychological hypotheses. Participants from a diverse sample of 930 U.S. residents were presented several psychological hypotheses. For each hypothesis, we assessed their prior beliefs, presented fictitious study outcomes, and then assessed participant's posterior beliefs. Crucially, we manipulated the presentation format and order of the presented study outcomes. Participants exhibited more belief updating when study outcomes were presented simultaneously compared to a sequential presentation format. In addition, the higher participants' prior beliefs, the more they updated their beliefs when confirmatory evidence was presented after disconfirmatory evidence, compared to a reversed or alternating order. We further investigated influences of participant-internal factors on belief updating and found a negative effect of subjective expertise regarding the hypothesis topic, and positive effects of trust in science and scientific literacy. Our results provide practical implications for science communication and point towards serial position effects in belief updating. They thus point to a memory-based sampling mechanism underlying belief updating based on scientific evidence rather than a continuous updating mechanism, such that participants represent individual pieces of evidence, which they retrieve and aggregate when having to construct a judgment.

Keywords: belief updating, science communication, advice taking, statistical modeling

Sourcing and Belief Updating in Individuals Exposed to Scientific Evidence: A Psychological Perspective

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Trust in science is essential for the adoption of science-based advice, as it supports belief updating grounded in empirical evidence. Yet, little is known about the psychological mechanisms and boundary conditions under which trust in science promotes individual belief updating. The present research reports a preregistered experimental study ($N = 1,305$; general population) examining how trust in science interacts with source expertise and evidence direction to shape belief updating in the domain of acupuncture. Using a mixed 2×2 design, participants first reported their initial acupuncture-related beliefs and were then presented with scientific evidence—in the form of four brief study summaries—that was either conclusive or diverging (i.e., evidence direction factor; between-subjects). In addition, this evidence was attributed to either high-expertise or low-expertise scientists (expertise factor; between-subjects), experimentally manipulated via author descriptions. Beliefs were assessed a second time following the manipulation (within-subjects factor). Results showed that evidence attributed to high-expertise scientists elicited stronger belief updating than evidence from low-expertise scientists. Moreover, trust in science played a moderating role depending on expertise and evidence direction: Compared to all other groups, individuals with higher trust in science updated their beliefs more strongly when the evidence was conclusive and came from high-expertise scientists. In contrast, when these credibility cues were weak, trust in science did not promote belief updating. These findings suggest that trust in science supports an adaptive pattern of information processing: It facilitates belief change in response to credible evidence while guarding against uncritical acceptance of inconclusive information from unreliable sources.

Keywords: belief updating, trust in science, source expertise, evidence evaluation

Part II: Negation Processing: Interpretation, Mechanisms and Effects

Monday, March 16, 11:00 - 12:30, HSZ - 7E02

Chair(s): Elena Albu¹, Francesca Capuano¹

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Negation has long been a central topic in psychology, linguistics and the cognitive sciences with interest in its nature and functions continuing to grow. Understanding negation is cognitively demanding: negative sentences are often associated with higher processing costs and error rates. A prominent view holds that comprehending negation involves representing two mental models—the negated situation and the actual one—and selectively inhibiting the former. Despite the early emergence of no in children’s vocabularies, full mastery of sentential negation develops relatively late. Beyond its role as a logical operator, negation serves diverse discourse functions, from denying plausible assumptions to correcting misinformation. While negation is a linguistic universal, its realization varies substantially across languages, and the processing consequences of these differences remain underexplored. Moreover, the influence of negation extend beyond language, shaping memory, attitudes, and behavior. Part II turns to acquisition and to influences of negation beyond language proper. Ulrike Schild shows that even two-year-olds struggle with sentential negation: an eye-tracking study finds no processing difference between “This is a mora” and “This is not a mora.” Chiara Boila examines whether preschoolers—whose executive functions are still maturing—face particular difficulty with negative utterances that require maintaining two pieces of information simultaneously. The remaining three contributions explore how negation shapes cognition outside the linguistic system: Emanuel Schütt investigates its role in attitude formation; Parker Smith tests ironic effects of negation on behavior; and Amit Singh asks how negative utterances influence event apprehension and contrast.

Keywords: Negation Processing, Cross-Linguistic Studies, Sentence Processing, Inhibitory Control, Language Acquisition, Executive Functions, Attitude Formation

Children learning German do not understand linguistic negation until the age of two

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Various studies involving children learning English were unable to demonstrate any understanding of verbal negation in toy search tasks before the age of 27 months. However, a recent study involving 24-month-old children learning French has shown that they take linguistic negations into account when learning new object names (de Carvalho et al., 2021, *Developmental Science*, 24, e13085, Experiment 2). In the present study, we tried to replicate the results of de Carvalho and co-workers by avoiding any non-verbal cues that could distinguish the negation condition from the affirmation condition (such as shaking one's head or less positive facial expressions). We tested 48 18-to-24-month-old children learning German. During a familiarization trial, all children saw a picture of a stuff toy and a video of a person using a novel name several times ("Mora"). For half of the children, the person produced affirmative sentences during the familiarization, e.g., "Yes, this is a Mora.". For the other half of the children, the person produced negated sentences, e.g. "No, this is not a Mora.". In a test trial, children saw the stuff toy from the familiarization trial next to a new stuff toy and where asked: "Where is the Mora?". Preregistered, planned analyses did not replicate any differences between the affirmation condition and the negation condition during the test trial (neither in the means nor in the cluster-based permutation analysis of the time course). Our data are in line with previous research revealing that linguistic negation is only understood after the age of two.

Keywords: negation, eye-tracking, toddlers

The processing of sentential negation in simple sentences: Evidence from German adults and children

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Previous studies have shown that negation is more difficult to process than affirmation (i.e., Kaup et al. 2006; 2007). One reason why negation seems difficult to understand is that the non-factual state of affairs is explicitly mentioned and strongly activated during initial processing. However, in order to process negation correctly, comprehenders need to inhibit the non-factual state of affairs and switch to the factual state of affairs. Hence, it has been suggested that negation may be associated with executive function (EF) abilities (Beltrán et al. 2019; Dudschig et al. 2021). Considering that EF abilities develop over a long period from infancy to early adulthood (Diamond 2006), negation processing might be even more challenging for children. In this study, we tested 58 German adults and 60 German preschool children (mean age: 5;2) to explore how they process sentential negation in simple sentences and to investigate whether EF abilities influence participants' processing. We presented 12 affirmative (e.g., "Tom rides now") and 12 negative sentences (e.g., "Tom doesn't ride") in a visual-world paradigm showing two pictures: one matching the sentence that participants heard while looking and the other depicting a different action performed by the character (e.g., "Tom swings"). Our data show that adults process negation in simple sentences faster than children, although both groups display a similar looking behavior suggesting the integration of the negator into sentence processing. In this talk, we discuss these findings as well as the role of EF abilities as potential factors affecting negation processing.

Keywords: negation processing, executive function, German acquisition of negation

Does the frequency of using negation serve as a diagnostic tool for attitude formation?

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Prior research on negation has mostly addressed questions related to language comprehension. However, it is well conceivable that negation also affects other cognitive functions, including attitude formation. The concept of activity inhibition (AI) offers a promising starting point in this context. AI is operationalized as the frequency of using the word “not” and considered an indicator of an individual’s capacity to suppress motivational impulses and behavior in real life. It has been shown that AI can moderate the effects of implicit motives – such as the need for power – on several (behavioral) outcome measures. In our research, we investigated whether people draw on such associations during the process of attitude formation. Each trial began with a text describing an individual who either had a low or a high need for power. This was followed by a statement uttered by that individual. The statement was characterized by affirmative phrasing or by frequent use of the word “not”. Finally, participants were asked to rate the individual on several dimensions (e.g., persuasiveness), which in prior research proved to be moderated by AI in relevant conditions. Thus far, we have found no evidence that participants rely on such associations when making judgments about individuals. Possibly participants simply lack this knowledge or do not draw on it during attitude formation. Currently, we are investigating whether changing the experimental setting by making the manipulation of polarity more salient results in different outcomes.

Keywords: negation, attitude, need for power, activity inhibition

Negation and Contrast: A Beneficial Context for Attention To Events and Their Memory?

Amit Singh^{1*}

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Negation, when used as linguistic scaffolding, can act as a spotlight on “what is now happening” while keeping “what just happened” in the locus of attention. In this sense, contrastive perception promotes a finer-grained understanding of events: it invites observers to encode not just that something occurred, but how the current subevent stands in relation to a salient alternative. In this talk, I develop the idea of contrastive verbal guidance, where language creates a pragmatic bridge between consecutive subevents by distributing attention more evenly across event structures. By explicitly referencing to prior moves while guiding the present one, negation can promote event apprehension and support more robust event memory. Building on results from a series of eyetracking experiments (e.g., Singh & Rohlfing, 2025), I argue that the effect of negation as a contrast can be observed across different visuo-linguistic dimensions, and that its usefulness depends on the contrastiveness already offered by the scene. When a context offers alternatives, negation can complement perception and make relational structure more visible. I synthesize these ideas as a starting point for a broader account of contrastive guidance, understood as a contextual use of negations to foreground relations rather than discrete event structures across perceptual dimensions.

Keywords: Negation, Contrast, Event apprehension

Irony Process Theory: Exploring the Cognitive Cost of Negation

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Wegner's ironic process theory posits that by attempting to avoid a specific outcome, that outcome becomes more likely. In this theory, a monitoring and an operating process consume cognitive resources during a task. When processing costs exceed the resources allocated, the likelihood of ironic errors increases. Studies investigating this phenomenon instruct what outcome a participant should avoid. Yet the phrasing of these instructions, in a negated or affirmative manner, may reveal more about the cognitive cost of negation. To test this concept, two ironic process theory experiments were conducted. Experiment 1 tested the prevalence of these effects in a heavily controlled setting, with participants guiding a circle along a vertical path on a computer screen. In each trial, the participant needed to keep the circle on the path by moving it along the horizontal axis via a mouse input. Path complexity and the polarity of instructions varied across the experiment. Then a follow-up study was conducted in a more applied setting using a dartboard. Participants were instructed both to hit the bullseye of the dartboard and to avoid either the upper or lower portions of the board in a negated or affirmative manner. We hypothesized that for both experiments, participants in the negated-instruction conditions would produce significantly more ironic errors than those in the affirmative-instruction conditions. If the data aligns with our hypothesis, these findings will provide direct evidence that the use of negation adds a unique cognitive cost that consumes the resources needed for mental control.

Keywords: Negation processing, Psycholinguistics, Mouse-tracking, Irony Process Theory, Linguistic Negation

Effects of Cognitive Aging on Memory, Arithmetic, and Multitasking

Monday, March 16, 11:00 - 12:30, C-Building - N14

Chair(s): Christina Artemenko¹

¹University of Tuebingen, Germany

In our modern aging society, individuals are required to maintain functional independence well into old age. Cognitive deficits associated with aging can therefore have a detrimental impact on everyday functioning and quality of life. Hence, it is essential to better understand how cognitive processes change during healthy and pathological aging. This symposium addresses this question by examining age-related changes in associative memory, arithmetic processing, and multitasking. Complementing experimental research methods, event-related potentials and multinomial modeling approaches were employed to identify the underlying mechanisms subserving cognitive functions. The presented studies involve a wide range of samples, spanning from non-clinical samples (healthy older adults) compared to younger adults to subclinical (older adults with subjective cognitive decline) and clinical samples (Parkinson's disease with or without cognitive impairment) compared to healthy controls. This methodological variety reflects the opportunities and challenges in the research field on cognitive aging.

Keywords: cognitive aging, healthy aging, cognitive impairment, memory, arithmetic, multi-tasking

Modified ERP patterns during associative encoding in healthy older adults with Subjective Cognitive Decline

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¹Trier University, Germany

Subjective Cognitive Decline (SCD) – a worry about one’s own cognition declining beyond normal age-related decline, in the absence of cognitive deficits in neuropsychological tests – is associated with an increased risk for actual cognitive decline at a later time. Hence, SCD may represent pre-clinical stage of dementia. In the present study, we examined whether event-related potential (ERP)-markers of episodic encoding show altered patterns in individuals with SCD versus a control group, potentially being more sensitive to subtle neurocognitive changes in this group. A community sample of 23 individuals with SCD and 23 controls memorized object pairs under interactive imagery instructions, followed by an associative recognition task. There were no statistically significant group differences in neuropsychological test scores or in memory performance. However, the groups differed in the amplitude of the frontal slow wave during memory encoding, and while the frontal slow wave showed a negative-going subsequent memory effect (SME) in the control group, this SME was absent in the SCD group. Memory-related ERP activity may be a more sensitive marker of pre-clinical stages of dementia than behavioral measures.

Keywords: aging, memory, subjective cognitive decline, event-related potentials

Is the Aging-Related Associative Memory Deficit Due to Impaired Storage or Retrieval?

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¹University of Mannheim, Germany

The associative deficit hypothesis (Naveh-Benjamin, 2000) proposes a pronounced aging-related deficit in associative memory. Semantic knowledge might moderate this deficit. Previous studies on the locus of this associative deficit yielded mixed findings on whether it stems from difficulties in storing or retrieving associations. In this lab study, we used two paradigms with semantically related and weakly related pairs, which enabled multinomial modeling to directly estimate separate storage and retrieval parameters. The pair-clustering paradigm (Batchelder & Riefer, 1980), involved free recall of clusterable words from the same semantic category (e.g., cat and dog) alongside singleton words with no clusterable associate. The free-then-cued-recall paradigm (Rouder & Batchelder, 1998) involved both free and cued recall of weakly associated cue-target pairs (e.g., flame-heat). The behavioral data from our sample of 63 older (60-89 years) and 65 younger (18-32 years) adults showed aging-related memory deficits on all recall tests. The modeling revealed both impaired associative storage and impaired associative retrieval of weakly associated pairs in the free-then-cued-recall paradigm. There was inconclusive evidence in the pair-clustering paradigm with semantic pairs: older adults' worse recall in this paradigm was primarily driven by a deficit in item memory. There was no indication that cluster storage differed between age groups, but results for cluster retrieval were ambiguous. This suggests that older adults compensate at least during storage processing for declining associative memory by relying more on semantic knowledge.

Keywords: associative deficit, aging, associative long-term memory, multinomial modeling, storage-retrieval model

Age-related effects in arithmetic facts and procedures

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Mental arithmetic is a cognitive domain that remains comparatively stable during adulthood. While domain-general processes (e.g., working memory, inhibition, processing speed) decline with aging, specific arithmetic processes are largely preserved. In two studies, we investigated how aging affects arithmetic facts and procedures by comparing older (≥ 60 years) to younger (18 – 34 years) adults in addition and subtraction with vs. without carry/borrow procedures. The general pattern of arithmetic performance showed that older adults were slower than younger adults to solve the arithmetic problems but did not differ in accuracy. In single-digit arithmetic tasks, the carry and borrow effects did not differ between the age groups, as older adults retrieved the solutions of larger problems from memory while younger adults had to calculate them. Older adults were therefore able to compensate general slowing by relying on faster retrieval strategies. In two-digit arithmetic tasks, the carry and borrow effects were similar or even smaller in older compared to younger adults, indicating that procedures relying on the place-value system remain intact during aging. Moreover, younger and older adults do not differ in the underlying processes, as both rely on categorical and continuous, magnitude-based processing for the carry effect, while the borrow effect is mainly processed categorically. These results suggest a highly developed fact network for single-digit arithmetic and intact arithmetic procedures during aging. We conclude that the age-related general cognitive decline affects arithmetic in terms of general slowing but spares arithmetic facts and procedures.

Keywords: arithmetic, aging, memory, lifespan development

Arithmetic deficits in Parkinson's Disease?

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Elderly people and patients with neurodegenerative diseases such as Parkinson's Disease (PD) rely on arithmetic skills to lead an independent life. Activities such as medication management or financial transactions require arithmetic abilities. However, research on cognitive deficits in PD has been focussing on domain-general functions such as executive functions so far, largely neglecting potential domain-specific aspects of numerical cognition (e.g., carry operations). These aspects should be addressed, as PD-immanent deterioration of domain-specific numerical areas and domain-general functions suggests mechanisms of both primary and secondary (mediated by other cognitive deficits) arithmetic deficits, respectively. The current study systematically investigated arithmetic performance and effects in PD patients differing in cognitive impairment, targeting domain-specific cognitive representations of arithmetic as well as the influence of domain-general factors. Besides $n = 40$ healthy controls (HC), $n = 50$ PD patients with normal cognition (PD-NC) and $n = 29$ PD patients with mild cognitive impairment (PD-MCI) were compared in arithmetic performance in the four basic operations (addition, subtraction, multiplication, division). The deficits consisted of lower accuracies in two-digit addition and subtraction and PD-MCI, as well as delayed arithmetic fact retrieval for single-digit multiplication and division in PD-NC and PD-MCI. Deficits were not domain-specific, as arithmetic effects (problem size, carry, and borrow effects) did not differ between the groups. Discriminant analyses showed that performance in addition, multiplication and division tasks could differentiate between PD-NC and PD-MCI. This study results help us to understand the underlying mechanisms of arithmetic deficits faced by PD patients in daily life.

Keywords: numerical cognition, Parkinson, arithmetic, mild cognitive impairment, neurodegeneration

Aging and Cohort Effects on Dual-Task Resource Allocation in Older Adults

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Background: Age-related declines in motor and cognitive systems increase dual-task interference costs (DTCs) during simultaneous walking and talking. Cohort differences (as birth year) may further shape how older adults allocate cognitive resources, with the "Stops Walking When Talking" (SWWT) strategy potentially serving as a compensatory mechanism. **Method:** In a cross-sectional sample of 4,443 healthy older adults (mean age = 74.8 years, range = 60.05-97.43), we examined DTCs using the Basel Motor Cognition Dual Task Paradigm. Participants walked at a preferred speed (single task) and performed semantic (animal naming) and working memory (counting backwards) tasks during dual-task walking. Generalized linear mixed models assessed the independent effects of age and cohort (birth year) on motor and cognitive DTCs, with SWWT as a potential compensatory predictor.

Results: Both age and cohort independently predicted larger DTCs. Older participants showed higher motor DTCs ($\beta = 0.04$, $p = .016$), while earlier birth cohorts exhibited greater cognitive DTCs ($\beta = 0.12$, $p = .004$). The SWWT strategy was not associated with DTCs but was more frequently observed in older participants and earlier cohorts, suggesting it serves as a compensatory response to increased interference rather than a preventive mechanism. **Conclusion:** Aging and cohort effects jointly exacerbate dual-task interference, with distinct patterns of resource allocation across generations. The SWWT strategy appears to be an adaptive response to manage cognitive-motor interference, highlighting the need to consider both chronological age and cohort effects.

Keywords: cognitive-motor interference, cognitive aging, resource allocation

Current Topics in Basic and Applied Memory Research

Monday, March 16, 16:30 - 18:00, HSZ - N1

Chair(s): Ryan Patrick Hackländer¹, Magdalena Abel²

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²University of Technology Nuremberg, Germany

The scientific study of human memory can be approached from many different angles, for example by focusing on basic questions about memory or on questions that arise with regard to memory in daily life or in applied settings. This symposium will showcase the great variety of current memory research by bringing together researchers who pursue different research questions - some of them addressing basic characteristics of memory, others addressing memory in application. The first talk by Mohammad Hamzeloo will consider how odors can be turned into associative cues that are effective in evoking memories. The second talk by Mira Schwarz and Kai Homburger will examine how memories of odors can shape spatial orientation and support smell-based navigation. The third talk by Alp Aslan will look into memory for object locations and forgetting effects mediated by selective memory retrieval. The fourth talk by Jan Rummel and Luca Leon Bieling will deal with eyewitness source memory and the influence of ethnic bias on the cheater-detection benefit. Finally, the fifth talk by Marius Böttzig will focus on collective remembering, in particular future thinking of Ukrainians during the Russian invasion of their country. In addition to the five talks, a final discussion slot will provide an opportunity to discuss overlap and joint themes across studies, as well as potential avenues for future research.

Keywords: Memory, Olfaction, Source memory, Future thinking

From Novel to Familiar: Training Odors into Effective Associative Memory Cues

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Odors are powerful triggers of autobiographical memory, yet they often serve as weak cues in controlled associative learning tasks. This study examined whether increasing odor familiarity through training can enhance their effectiveness as associative memory cues. An experimental group first completed a four-week odor training phase in which they repeatedly smelled and rated a subset of initially low- and high-familiar odors. A control group received no such training. Both groups then performed an odor–picture paired-associate (PA) learning and then testing task. Results showed that a 4-week odor training program, conducted weekly, significantly enhanced the efficacy of low-familiar odors in a PA memory paradigm. Specifically, trained low-familiar odors showed higher accuracy and faster reaction compared to untrained low-familiar odors in the experimental group. Low-familiar odors are thought to typically have weaker memory representations due to limited prior exposure, leading to lower accuracy and slower retrieval in memory tasks. Our results suggest that odor training, through repeated active exposure (e.g., odor-rating tasks), strengthens the cognitive and perceptual representations of low-familiar odors, thereby improving their effectiveness as cues in PA tasks. These results highlight familiarity as a key factor in the formation and retrieval of odor-based associations. By moving odors along a continuum from novel to familiar, we can transform them into more effective memory cues. This work provides a framework for future studies comparing olfactory cue training to other sensory modalities and exploring how semantic and perceptual learning jointly determine the mnemonic power of odors.

Keywords: odor familiarity, associative memory, olfactory training, paired-associate task

Smell-based navigation: How odor memory can shape spatial orientation

Mira Schwarz^{1*}, Kai Hamburger¹

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For decades, humans were believed to have a poor sense of smell. This misconception has overshadowed the fact that olfaction is one of the most ancient and fundamental senses, essential for survival, communication, and spatial orientation. While nonhuman animals rely heavily on olfactory cues for navigation, human research has remained largely dominated by visual paradigms, overlooking the subtle yet powerful role of smell in guiding behavior. Recent experimental work challenges this view by demonstrating that odors can shape spatial orientation through distinct, primarily implicit mechanisms. Behavioral evidence shows that olfactory cues, even when not consciously attended to, can enhance wayfinding performance and influence memory for spatial environments. Compared to visual cues, odors evoke stronger emotional responses, suggesting that they provide a robust and phylogenetically old mechanism for orientation. These findings imply that humans, like many other species, can use their olfactory system for navigation, often without conscious awareness. Understanding this implicit form of olfactory navigation not only fills a critical gap in cognitive science but also has practical implications. Insights into odor-based orientation may inform the design of multisensory environments and inspire novel applications in fields ranging from environmental design to therapeutic interventions. Human wayfinding, therefore, should be understood as a truly multisensory process, in which smell quietly but powerfully helps us find our way.

Keywords: odor, olfaction, spatial cognition, navigation, smell, odor memory, implicit memory

Retrieval-induced forgetting in object location memory

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Retrieving information can enhance memory for the retrieved information, but—more important for the current research—it can also impair memory for related, non-retrieved information. This phenomenon, known as retrieval-induced forgetting (RIF), has been extensively studied in verbal memory. The present study examined whether RIF also extends to memory for object locations. In Experiment 1, participants learned the locations of 16 objects arranged on a 4×4 grid. During a subsequent retrieval-practice phase, they were presented with an empty 4×4 grid and a randomly selected half of the objects, and were asked to place these eight objects on their correct locations. In the final test phase, participants again received an empty 4×4 grid and were asked to place all previously studied objects on their correct locations, beginning with the unpracticed objects. Results revealed that selective retrieval practice enhanced memory for the practiced locations but impaired memory for the unpracticed locations. Experiment 2 replicated this pattern of results using a novel set of 16 objects and 5×5 grids during study, retrieval practice, and test. More importantly, including a restudy condition, Experiment 2 demonstrated that selective restudy of certain object locations during the intermediate phase improved later memory for the restudied locations but had no effect on unpracticed locations, indicating that RIF in object location memory is retrieval-specific. The results are discussed with reference to both inhibitory and non-inhibitory accounts of RIF.

Keywords: retrieval, retrieval-induced forgetting, object location memory, inhibition

When Appearance Shapes Memory: Ethnic Bias Modulates the Cheater-Detection Benefit in Eyewitness Source Memory

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This study investigated how behavioral descriptions, ethnic appearance, and crime stereotypes influence eyewitness source memory. Previous research has shown improved memory for perpetrators (i.e., the Cheater-Detection Benefit; CDB) but poorer memory for individuals from other ethnic backgrounds (i.e., the Other-Race Effect; ORE). The present study builds on these two phenomena by examining whether memory for criminal versus neutral behaviors varies as a function of a person's ethnic appearance. A total of 109 White German participants viewed German and Iranian male faces paired with descriptions of either criminal acts or occupations, which had been pretested as stereotypical for one or the other ethnic group. After a short filler task, participants were asked to recognize the faces and recall the associated behavior. Results revealed a significant interaction between behavioral description and ethnic appearance: participants correctly attributed criminal behaviors more often to faces from their own ethnic group, whereas neutral behaviors were remembered better for faces from the other ethnic group. Thus, the CDB emerged only for own-group faces. Overall, recognition accuracy was higher for own-group than for other-group faces, confirming the ORE, which may have facilitated stereotypic guessing when participants had to remember faces from a less familiar ethnic group. These findings demonstrate a moderating role of ethnic appearance in eyewitness memory, highlighting a boundary condition for the CDB and offering important implications for forensic practice.

Keywords: Eyewitness memory, Cheater-Detection Benefit, Other-Race Effect, Crime stereotypes

„We will be free“: The wartime positivity effect in collective future thinking in Ukraine

Marius Boeltzig^{1*}

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Even in adverse conditions, people imagine what their own future and that of their country will look like. While previous work has established that crises like the COVID-19 pandemic make people less optimistic about their future, no study has investigated future thinking during an ongoing war. In an online survey study, Ukrainian participants ($n = 377$) as well as German ($n = 239$) and Polish ($n = 207$) controls were asked to imagine both their personal future, and the future of their respective countries. Surprisingly, Ukrainians felt significantly more positive about the future of their country than Germans and Poles and had a stronger sense of being able to actively shape it. This remarkable wartime positivity effect was even stronger in participants who were more impacted by the war. Additionally, personal and collective future thinking were more merged in Ukraine than the control countries. The usual split of higher positivity about the personal compared to the collective future was reduced in Ukraine. Additionally, Ukrainians mentioned collective events and their country more often, even when discussing their personal future. The results indicate that under extreme circumstances, personal and collective future thinking can be more aligned, as the fate of the nation is more coupled with the fate of the individual, and more positive, as the adversity of war can also be seen as an opportunity for change.

Keywords: personal future thinking, collective future thinking, war, identity

Attributing Minds to Machines: Psychological Mechanisms of Social Cognition in Human-Robot Interaction

Monday, March 16, 16:30 - 18:00, HSZ - N2

Chair(s): Jan Pohl¹

¹Humboldt-University, Berlin, Germany

With the rapid advancement in artificial intelligence technologies and increased media coverage of robots, humans are becoming more aware of artificial agents, some even testing them by interacting with online agents like chatbots. This exposure provides a unique opportunity to study how humans generalize social perception beyond biological agents, offering insights into the flexibility and boundaries of social cognition.

Understanding how people perceive and interact with these agents is central not only to the design of effective human-robot collaboration but also to uncovering fundamental aspects of social cognition. When and why do people attribute sociality, intentionality, or even moral capacities to machines? And how do seemingly simple cues in robot behavior shape complex human perceptions? This symposium brings together five empirical contributions investigating the psychological mechanisms underlying complex attributions toward robots in diverse interaction contexts. It explores how perceptions of a robot's social nature influence cooperative engagement and trust, how subtle behavioral or paralinguistic cues shape impressions of humanness and identity, and how movement patterns guide inferences about underlying intentions or mental capabilities.

Taken together, these investigations reveal how both low-level perceptual cues and higher-order cognitive evaluations jointly shape human responses in collaborative and observational contexts, offering new insights into how social cognition operates at the boundary between human and artificial agents. The series of talks aims to foster interdisciplinary discussion among experimental psychologists, cognitive scientists, and roboticists, offering new insights into how humans make sense of increasingly social machines and what this reveals about the architecture of human social cognition.

Keywords: Human-robot interaction, robots, mind perception, social roles, attitudes, behavior, collaboration

Collaboration in human-robot interaction depends on mind perception

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Robots are increasingly available for workplace collaboration, which raises the question of which tasks people are willing to assign to robots and how strongly this is influenced by their perceived mental capacities. Based on the two-dimensional model of mind perception, we investigated in several experiments how humans assign tasks to robots as a function of their perceived agency (i.e., ability to plan and act) and experience (i.e., ability to sense and feel). Participants performed an analytical task (i.e., calculating differences) and a social task (i.e., judging emotions) and were allowed to offload the task to a robot at any time. Based on previous work on agent-task fit, we expected participants to offload the analytical task more often to robots than the social task, as robots are perceived as higher in agency than experience. For robots with varying levels of the experience factor, we expected participants to offload the social task more often and the analytical task less often to a robot described as emotionally capable (i.e., experience high) versus incapable (i.e., experience low). In line with our hypotheses, participants collaborated significantly more with robots for the analytical than the social task, and collaborated more with the emotionally capable robot for the social task and the emotionally incapable robot for the analytical task. This effect is in line with the “specificity of mind” hypothesis and was prevalent despite the fact that both robots were equally proficient with both tasks—a fact participants were informed about at the beginning of the experiment.

Keywords: mind perception, specificity of mind, offloading, agent-task fit

Psychological Predictors of Public Attitudes Toward Social Robots

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Understanding public attitudes is crucial for the successful design and social implementation of AI-based systems, especially taking into account the fact that AI is dynamically integrated into everyday life. The presented studies aimed to investigate attitudes toward AI and robots in Polish samples, using the NARS (Negative Attitudes toward Robots Scale), BHNU (Beliefs about Human Nature and Uniqueness) questionnaires and the set of custom questions. The first study examined differences across university disciplines, revealing significant effects of educational background on attitudes: students of engineering and technology expressed more positive and cooperative views toward AI compared to those from social sciences and humanities, who reported higher discomfort and anxiety toward anthropomorphic or socially interactive AI. The second study, conducted on a broader Polish sample, confirmed generally cautious but not hostile attitudes toward robots, with acceptance depending on perceived usefulness and limited human-likeness. The obtained results may serve as the preliminary proof that both cultural context and educational experience shape how individuals perceive and accept AI, underscoring the importance of tailored communication and design strategies in promoting trust and adoption.

Keywords: Human-robot interaction, artificial agent, public attitude, social agents

From Paralinguistic Cues to Gender Perception: Understanding The Factors That Shape Human–Robot Interaction

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Humanoid robots are increasingly envisioned for socially embedded roles in education, assistance, and healthcare. Before such systems can be meaningfully integrated into real contexts, it is essential to understand how people form impressions of them and how human social biases shape these perceptions. Humans naturally personify robots, especially humanoid ones, perceiving them as part of a human social system and attributing human-like qualities. Gendering robots is common, even when they are designed to appear gender-neutral. One of the strongest predictors of perceived gender is a robot's voice. This talk will examine how attitudes toward robots are affected by their perceived gender in contexts involving emotional facial expressions and conflict resolution scenarios. It will also explore how users' own gender stereotypes may influence their expectations and interpretations of robotic behavior. The broader goal of this research is to inform the development of trustworthy, socially aware robots that effectively engage users without reinforcing harmful gender stereotypes.

Keywords: Human-robot interaction, gender bias, social cognition

Paths of Perception: From Robot Navigation to Mind Attribution

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In everyday interaction, people readily interpret simple motion cues as meaningful indicators of an agent's internal states. While much work on robot behaviour emphasizes complex social signals or isolates single navigation cues, it remains unclear whether basic movement features—such as changes in speed, trajectory, approach direction, or interpersonal distance—are sufficient to shape broader judgments of intention, agency, and social awareness. The present research examines the perceptual pathways through which users evaluate these minimal movement cues and how such cues give rise to mind-related attributions. In a first study, participants evaluated three robot embodiments to determine how physical form shapes baseline assumptions about agency and social competence. The results showed that embodiment alone produced no systematic differences; instead, participants' perceptions varied primarily as a function of how the robots moved. In a second study, participants reported detailed expectations for how robots should behave while navigating—how close they should pass, from which direction they should approach, how their speed should change, and how perceptually present they should appear in shared space. These responses revealed strong, cue-specific preferences even for very simple movement features. These insights form the foundation for a navigation experiment using the Pepper robot, in which the derived movement parameters were implemented to examine how simple adjustments shape user perception. Preliminary participant ratings indicate increased perceived animacy, safety, movement preference, and naturalness for the adjusted navigation. Together, the findings identify simple navigation cues as an important perceptual basis for mind attribution and user expectations in human-robot interaction.

Keywords: human-robot interaction, user expectations, mind attribution, motion perception

When Less is More: Robots Showing Cues for a Single Behavioral Characteristic Perceived as More Human-Like

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In everyday interaction, people show a consistent tendency to anthropomorphize or attribute aspects of selfhood to nonhuman agents. In previous studies, we found that people (over-)generalize from the presence of a single behavioral cue to selfhood (like the ability to learn or attention sharing) to the presence of other (absent) cues—suggesting that cueing a small aspect of selfhood is sufficient to trigger the entire selfhood concept with all its implications. Here, we tested the prediction that single selfhood cues are as efficient as multiple selfhood cues in eliciting selfhood attributions to an artificial agent. In three experiments, we compared selfhood ratings elicited by a robot exhibiting behavioral cues of efficiency, learning sensitivity, and equifinality with ratings for a robot exhibiting only one of these cues. Contrary to our expectation, participants did not show the same degree of selfhood attribution to both robots, but more selfhood-attributions towards the single-cue robot in Experiments 1 (single efficiency cue) and 3 (single equifinality cue), while in Experiment 2 (single learning cue), the multiple-cues robot received higher ratings on the manipulated characteristics as well as on context sensitivity (results for selfhood-attribution were negligible). In sum, we conclude that a single selfhood cue tends to elicit stronger selfhood-attributions overall than multiple cues.

Keywords: self, mind, agency, attribution, bootstrapping, human-robot interaction, non-humanoid robot

Symbolic Representations in the Visual Pathway: From Numbers and Letters to Words and Semantics

Monday, March 16, 16:30 - 18:00, HSZ - N3

Chair(s): Jack E Taylor¹, Janos Pauli²

¹Department for Psychology, Goethe University Frankfurt, Germany

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Written script, including numbers, letters, and letter-strings, is a recent cultural invention central to letter- and number-literate societies. In such societies, humans learn early on to recognise glyphs and map them fluently onto specific sounds and concepts. This symposium explores how the brain achieves this objective, using multiple complementary lenses to understand the processing of linguistic and mathematical symbols, the degree to which these representations are distinct, and interactions between visual symbol recognition and abstract processes of language and numerosity.

The first talk introduces a predictive coding-motivated computational model of letter recognition, showing how these principles might explain the recognition of letters in noisy environments. This work suggests that predictive coding accounts of word recognition may also apply to isolated letters. The second talk uses an optimal transport framework to model the space of early visual representations of letter symbols revealed by EEG, exploring how such representations may be altered in dyslexia. This work tests whether this learning disorder in reading also results in weaker neural alignment with computational models of letter representations. The third talk presents an analysis of human fMRI and macaque electrocorticography responses to naturalistic images, suggesting a shared prominent representation of stimuli related to both orthography and numerosity. This finding is discussed in relation to the notion of proto-architecture for mathematical cognition in the higher-level visual cortex of non-human primates. The fourth talk examines interactions between the processing of Arabic digits and language. This study exploits the discrepancy between the base-10 system of Arabic numbers and base-20 system of French number words, finding that native French speakers utilise language during a numerical task, even when language is redundant. The fifth talk explores how the brain processes words with varying degrees of misspelling. Using MEG data, it examines connectivity between lower visual areas and the lvOT, suggesting that lvOT processes real words in a feedforward manner but engages feedback mechanisms for misspelled words and pseudowords. Combining experimental and computational approaches, this symposium advances our understanding of how the brain maps arbitrary visual forms into meaningful symbolic representations, and how these processes interact with language and numerosity.

Keywords: symbols, visual, orthography, language, numerosity, reading

Robust Letter Recognition through Predictive Coding: Insights from a Computational Model

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Reading is a human invention that became an essential part of societal participation. Expert readers can perceive around 200-300 words per minute, indicating that they process words and letters with high efficiency. Despite the significant role of the letter-level, most models of visual word recognition neglect or oversimplify the processes underlying letter recognition. This gap is detrimental, since reading a word becomes impossible without separately identifying its constituent letters. Here, we develop a transparent neuro-cognitive model of letter recognition based on the principles of predictive coding. We assume that humans decompose visual letter information into features that describe distinct letter characteristics and shapes. These distinct features then activate font-invariant letter-prototype representations to identify the letter. To evaluate the computational implementation of the model, we conducted a letter identification task with increasing levels of noise. We collected behavioral and EEG data to compare two variants of the model: (i) one applying knowledge-based top-down influences on all processing levels assumed in predictive coding, or (ii) one that is strictly processing information in a feed-forward way. We demonstrate that the predictive-coding-based model variant best simulates behavioral response patterns. Furthermore, the model transparency enables us to understand that the key to the model's success lies in the feature-level predictions. Additionally, the internal model representations exhibit significant correlation with reaction-time data and EEG activation around 200 ms. Thus, we provide a letter recognition model that demonstrates how efficient neuronal processing, through predictive coding, results in letter identification behavior innate to optimal reading capacities.

Keywords: Letter Recognition, Mechanistic Modelling, Predictive Coding, Reading

Comparing Early Visual Representations of Letters in Dyslexic and Typical Readers

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The earliest stages of visual word recognition involve recognising the shapes of letters and characters that make up words. In this preregistered study, we examine whether such early neural representations of letter shapes differ between 20 participants with Dyslexia and 20 controls, matched on age, gender, education, and non-verbal IQ. In a Bayesian, hierarchical representational similarity analysis of electroencephalography (EEG) data, we examine group differences in brain-model alignment. We focus on a recent computational framework built on optimal transport theory, in which representational similarity is proportional to a minimum edit distance between two-dimensional histograms of letters. A key feature of this framework is that it can be used to capture a transition from more feature-based, retinotopic representations, to more structural representations, invariant to transformations like translation, rotation, scaling, and mirroring. We apply this approach to examine (1) whether the typical-reading control participants replicate previous results, (2) whether the computational models align better or more poorly with the neural activity of dyslexic participants, and (3) whether dyslexic participants differ in the degree of invariance to transformations. Data collection is ongoing, but current results from dyslexic participants tested so far suggest that their neural representations of letters align less well than expected (based on the prior from the previous study) with the optimal transport models, including reduced evidence for invariant representations. These initial findings tentatively suggest that even early neural representations of single letters may differ in dyslexia.

Keywords: visual word recognition, dyslexia, EEG, RSA, optimal transport

Cross-species Decomposition Reveals a Shared Representation for Symbols in Primate IT

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In this study, we investigate the functional organization of primate inferotemporal cortex (IT) during vision. We compared macaque intracranial and human fMRI responses to naturalistic images by aligning these data into a common space. This revealed a rich high-dimensional code shared between primates, composed of semantic and visual features. In this talk, we concentrate on one observation about this shared primate space: the prominence of orthographic stimuli such as symbols and icons, as well as numerosity (multiple objects in a scene). We run a host of analyses to evaluate these cross-primate representations, and consider their empirical relevance for the notion that a proto-architecture for mathematical cognition exists in the higher-level visual cortex of non-human primates.

Keywords: orthographic processing, abstraction, vision, primate, inferotemporal cortex, functional architecture

Linguistic influences on two-digit number processing in French speakers

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Although Arabic numerals are universal across cultures, studies on languages with inverted number word syntax suggest that spoken language modulates the processing of Arabic digits. The current study investigated how verbal codes influence the processing of visual digits by exploiting a unique linguistic quirk in French where numbers above 60 follow a vigesimal (base-20) system (e.g., 72 = “soixante-douze” or “60-12”). Sixty native French speakers performed a magnitude comparison task with two-digit Arabic numbers. Beyond the classic unit-decade compatibility effect (UDCE) driven by decimal structure, linear mixed models additionally uncovered a unit-vigintade compatibility effect (UVCE) for numbers above 60, mirroring the base-20 syntax of French number words. The decimal within-decade effect also had a vigesimal equivalent: Within-vigintade pairs (e.g., 86 vs. 95) were processed as quickly as within-decade pairs (e.g., 82 vs. 85) and faster than between-vigintade pairs (e.g., 76 vs. 85).

These vigesimal effects indicate that language is not merely a tool for expressing quantities but an active scaffold for interpreting visual symbols, even when the number word is task-irrelevant. By showing how cultural-linguistic conventions influence symbolic processing, this work bridges visual number recognition with higher-order language systems, illuminating how the meaning of symbols is accessed through via linguistic representations.

Keywords: Unit-Decade Compatibility Effect, Number Word Syntax, Number words, Vigesimal number system, base-20 system, base-10 system, decimal system

Separating feedforward and feedback dynamics in left vOT during word reading

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Left ventral occipitotemporal cortex (vOT) is crucial in reading. Its functional role is viewed either as a prelexical feedforward hub or a bidirectional interface between sensory and higher-order linguistic systems. To consolidate the two views and comprehensively explain the functional complexity of left vOT, we investigated the temporal and spectral dynamics of information flows involving left vOT during visual word and pseudoword reading using magnetoencephalography (MEG) and two directed connectivity metrics, i.e., phase slope index (PSI) and Granger causality (GC). Specifically, feedforward connectivity from low-level visual areas to vOT was observed for all conditions, with the strength of orthographic information flow to left superior temporal cortex (ST) modulated by stimulus word-likeness. Conversely, feedback flow from left ST to vOT appeared for pseudowords that allow top-down linguistic constraints to facilitate reading, and occurred later for word-like than complete pseudowords. Our findings suggest that left vOT during word reading functions in a hybrid manner: operating in efficient feedforward mode for familiar word recognition while flexibly recruiting bidirectional processing for unfamiliar pseudowords. By disentangling feedforward and feedback dynamics with high temporal and spectral resolution, we empirically reconcile different theories of vOT function.

Keywords: left ventral occipitotemporal cortex, MEG, directed connectivity, word reading, time-frequency resolution

Recent Insights in Metacognition Research

Monday, March 16, 16:30 - 18:00, HSZ - N4

Chair(s): Luisa Schulz¹, Franziska Ingendahl²

¹University of Mannheim, Germany

²Technical University of Darmstadt, Germany

Research on metacognition investigates how people understand and regulate their own cognitive processes. This symposium addresses how metacognitive monitoring judgments are formed and how they influence effective learning. The first two talks focus on the underlying basis and accuracy of metacognitive judgments: Schulz, Bröder, and Undorf show that people integrate multiple cues when making metacognitive control decisions. Leipold and Berthold find that Judgments of Remembering and Knowing (JORKs) differ from traditional Judgments of Learning (JOLs) in memory processes, although the previously reported accuracy advantage of JORKs was not replicated. In the third talk, Schaper and Ingendahl present evidence on how metacognitive judgments shape item and source memory. The last two talks provide insights into more applied aspects of metacognition: Zawadzka and Hanczakowski show how feedback motivates learners to solve general knowledge facts themselves. Finally, Undorf, Ingendahl, Janson, Wissel, and Münzer demonstrate that JOLs predict learning behavior and success in a higher education learning setting. Together, the talks provide new insights into the mechanisms and consequences of metacognitive monitoring for learning and memory.

Keywords: metacognition, metamemory, learning, memory, judgments

Cue Integration in Metacognitive Control Decisions

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Like judgments about the external world, metacognitive judgments involve uncertainty and rely on probabilistic cues. While previous work shows that people combine multiple cues when making judgments of learning (JOLs), much less is known about whether metacognitive control decisions depend on multiple cues as well. In two experiments, participants studied 60 words that varied on two cues (Experiment 1: concreteness, emotionality; Experiment 2: font format, word frequency). In Experiment 1, all participants made restudy choices to maximize later recall. In Experiment 2, half made restudy choices and the other half provided JOLs. Participants who made restudy choices restudied their selected items before all participants completed a final recall test. In Experiment 1, both cues influenced restudy choices at the group level. In Experiment 2, only one cue influenced aggregate behavior. However, per-participant effect sizes revealed that most individuals used both cues, but in opposite directions: some preferentially restudied items with cue values associated with lower JOLs (as predicted), whereas others preferentially selected items with cue values associated with higher JOLs. These results suggest that multiple cues guide metacognitive control, but cue use differs across individuals. We conclude that motivational influences could contribute to a reduced alignment between monitoring and control.

Keywords: metamemory, cue integration, metacognitive control, restudy choices, JOLs

Judgments of Remembering and Knowing (JORKs): Quo Vadis?

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Metamemory monitoring is critical for effective control decisions, such as allocating study time. Recent research suggests that making Judgments of Remembering and Knowing (JORKs) instead of Judgments of Learning (JOLs) may enhance monitoring accuracy. While JOLs are confidence ratings of future memory performance typically provided on a percentage scale, JORKs distinguish between recollection (“remember”), familiarity (“know”), and absence of memory (“forget”) on a three-point scale. Prior findings indicate that JORKs yield higher relative accuracy than immediate JOLs and are less influenced by illusionary cues, presumably because they direct attention toward more diagnostic information. The present study aimed to replicate this reported JORK benefit and examine its proposed underlying mechanisms. We found that JORKs mapped differently onto familiarity and recollection processes than JOLs, consistent with theoretical predictions. However, this processing distinction did not translate into higher monitoring accuracy for JORKs. These findings challenge the robustness of the previously reported JORK advantage and indicate that JORKs may not provide a reliable means to enhance metamemory accuracy in research or applied contexts.

Keywords: metamemory, judgments of learning, judgments of remembering and knowing, relative accuracy, metamemory monitoring

Metamemory Reactivity in Source Monitoring

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Soliciting metamemory judgments can alter memory—a phenomenon known as judgment reactivity. While reactivity effects on item memory (e.g., enhanced recognition) are well established, little is known about their impact on other memory components such as source memory (remembering where information came from). Across a series of experiments, we compared reactivity effects of item-memory predictions (Judgments of Learning, JOLs) and source-memory predictions (Judgments of Source, JOSs) on both item and source memory within a source-monitoring paradigm. Participants studied items (statements or words) presented by one of two sources and either made JOLs, JOSs, or no judgments (control). At test, they remembered both the items and their sources. Replicating prior work, metamemory judgments enhanced item memory relative to control, particularly for simple word materials. This positive reactivity occurred for both JOLs and JOSs. In contrast, source memory was impaired by both types of judgments. This dissociation suggests that making metamemory judgments may shift participants' goal toward item encoding at the expense of source encoding—potentially reflecting a goal prioritization when resources are limited. Theoretical implications for reactivity and metamemory monitoring are discussed.

Keywords: Metamemory, Source Monitoring, Judgments of Learning, Judgments of Source, Reactivity

Curiosity and need for agency after negative feedback

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Responding to general knowledge questions is associated with various levels of curiosity as to the identity of correct responses. People seem to be most curious when they feel they know the answer to a question but receive negative feedback indicating that their confidently held answer was in fact incorrect. In this situation, would they wish to receive the actual correct answer immediately, or would they wish to exercise agency by having another go at responding to the question? We examine this issue by using deceptive questions, manipulating the presence of (negative) feedback following the responses to these questions, and providing the opportunity to either see the correct answer outright or to receive a hint for an additional attempt at responding to the question. We show that the presence of feedback motivates participants to more often try to respond to the questions by themselves.

Keywords: curiosity, deceptive questions, metacognitive control

Judgments of Learning Predict Learning Success and Behavior in Higher Education

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Numerous experimental studies have shown that judgments of learning (JOLs), people's predictions of their future performance during learning, are moderately predictive of test performance and learning behavior. However, almost all previous studies have used relatively simple learning materials and low-stakes tests. Consequently, little is known about the predictive power of JOLs in ecologically valid learning environments. To address this gap, we collected JOLs in an intelligent tutoring system that university students used to prepare for their final exams in Statistics (Study 1, $N = 90$) and Educational Psychology (Study 2, $N = 145$) and retrieved objective indicators of learning success and behavior from the tutoring system. JOLs significantly predicted both exam performance and learning success within the system, even after controlling for GPA. Moreover, JOLs predicted how students allocated their study time. Together, these findings demonstrate that JOLs possess predictive validity in real-world learning contexts.

Keywords: Judgments of learning, self-regulated learning, metacognition; metamemory, intelligent tutoring systems

What Illusions Tell Us About How Perception Works

Monday, March 16, 16:30 - 18:00, HSZ - N5

Chair(s): Elisabeth Hein¹

¹University of Tuebingen, Germany

In order to perceive and meaningfully interact with the world around us, our sensory systems need to interpret the incoming information. This interpretation process is well illustrated in the case of illusions. With some illusions we perceive very different things in one and same input, as for example in the famous Necker cube or “The dress”, which can be seen blue and black or white and golden. Other illusions make us perceive colors where there are none, as in the watercolor illusion, or cause-and-effect relationships and animacy with simple dots. Therefore, illusions are a wonderful tool to understand more about how perception works. In the symposium, we will look at this question using a variety of different experimental methods and very different illusions in order to learn more about different aspects of perception ranging from auditory motion perception to robotic vision. In particular, in the first talk Meike Kriegeskorte and colleagues will use auditory apparent motion to investigate which factors influence how object correspondence is established, i.e. object identity is perceived despite changes in location across time. In the second talk Shalila Freitag and colleagues will talk about EEG correlates of perceptual (un-)certainty and the role of stimulus predictability when participants observe stimuli with varying degree of ambiguity/visibility (Necker lattices and smiley faces). In the third talk Ben Sommer and colleagues will investigate perceived causality in a paradigm in which a disc can either be perceived as launching another disc or as passing across the other disc. In particular, they use visual adaptation to look at the influence of a launch or pass context on an ambiguous display. In the fourth talk Vebjørn Ekroll will use examples of magic tricks around the illusion of absence that work better than one would expect based on the method of the trick and how perception works. In the last talk Aravind Rao Battaje and colleagues will present work on whether robotic perceptual models could predict population-level and individual human responses to visual illusions, using the example of the fill-in color aftereffect and Silencing by motion.

Keywords: perception, perceptual illusions, magic, apparent motion, perceived causality, ambiguity, robotic vision

Feature-dependent perception of auditory apparent motion

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A crucial ability of our cognition is the perception of objects and their motions. We can perceive objects as moving by connecting them across space and time, even when they are not present continuously, such as when objects are occluded. Apparent motion is an illusion, in which, given the right spatiotemporal distance, stationary flashes are perceived as moving from one location to another. This phenomenon exists not only visually but also auditorily. Examining the factors that influence apparent motion helps us to understand how objects are connected across space and time. In this study we used the Ternus display, an ambiguous apparent motion display, which can be perceived as two stimuli moving uniformly to the right (group motion) or one stimulus moving across the stationary center stimulus (element motion), depending on how the objects are connected over time. The percept is influenced by the inter-stimulus interval (ISI) and the stimulus features in the visual modality. Previous research has shown that the Ternus effect also occurs auditorily and depends on the ISI, suggesting that correspondence mechanisms may work similar across modalities. To test this idea further, we investigated whether the auditory Ternus effect depends on stimulus features by creating frequency-based or timbre-based biases. These biases were either compatible with the element motion or with the group motion percept. Our results showed an influence of this feature bias in addition to an ISI effect, suggesting that the visual and the auditory modalities use similar mechanisms to connect objects across space and time.

Keywords: Perceptual organization, grouping, object correspondence, apparent motion, Ternus display, auditory perception

Perceptual (un)certainty needs to be predictable to be measured in the EEG

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Visual stimuli without one clear interpretation of highest likelihood (e.g., certain illusions) induce perceptual uncertainty. In a series of studies, we found EEG correlates of this perceptual uncertainty with smaller ERP (Event Related Potential) amplitudes with ambiguous/low-visibility stimuli (perceptual uncertainty) compared to disambiguated/high-visibility stimulus variants (perceptual certainty) (Cohen's $d = 0.6$ - 1.2). The underlying experimental paradigm showed only one stimulus variant (e.g., disambiguated or ambiguous) per condition creating high predictability of successive stimuli. Preliminary results from a pilot study with random presentation of both ambiguous and disambiguated stimulus variants indicated absence of this ERP Uncertainty Effect. The aim of the present study was to confirm this finding and to find the necessary number of repetitions to maximize the ERP Uncertainty Effect. In an EEG study, we presented Necker lattices (ambiguous/disambiguated) or smiley faces (low/high visibility of emotional expression) in predictably ordered blocks of 12, 48 (Necker and smileys) and 120 (Necker) repetitions. We also showed ambiguous and disambiguated variants of the Necker lattice in random order for 120 stimulus repetitions. The ERP Uncertainty Effect was absent when stimuli were presented randomly. When the order was predictable, the ERP Uncertainty Effect was present for all block lengths tested in both Necker and smiley conditions. Further analysis revealed the effect to reach its maximum after 6 to 10 stimulus repetitions (8.4 to 14 seconds). Our results confirm the importance of predictability to measure perceptual certainty via EEG and give further insights into the timescale of the underlying processes.

Keywords: visual perception, perceptual uncertainty, temporal processing, prediction, Necker cube, Event Related Potential

Causal Illusions: Visual Adaptation of Causality via Perceptual Grouping

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The perception of causality turns mere visual sequences into meaningful cause-and-effect relations. When a moving disc stops right next to a second disc that then begins moving in the same direction, we typically perceive that the first disc launched the movement of the second disc. Conversely, increasing the overlap between the discs, leads observers to report that one disc is passing over the other. Context events, such as concurrent launching events or concurrent motion onsets, result in a causal illusion that increases the perceived causality. In contrast, visual adaptation to launches (i.e., the repeated presentation of launches) subsequently reduces the proportion of reported launches in subsequent test events. Here, we asked whether illusory launches may drive visual adaptation of causal perception similarly to a physical launch. Both before and after presenting a visual adaptor, we quantified the perception of causality by parametrically varying the disc overlap in the test events and fitting psychometric functions to the proportion of reported launches as a function of disc overlap. The adaptor was either a classical launch, an illusory launch (a concurrent motion onset grouped with the test event), or a control condition featuring a context event not grouped with the test event. Importantly, only the classical launch adaptor reduced the proportion of causal reports. Illusory launches did not result in such negative aftereffects. Thus, although context-driven causal illusions induce impressions of causality, visual adaption of causal perception operates exclusively based on the spatiotemporal (as opposed to the perceived illusory) characteristics of launching events.

Keywords: perception of causality, visual adaptation, context events

Learning about perception by studying the art of magic

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Many magic tricks work much better than one would expect based on knowledge of the secret method and known psychological mechanisms, which suggests that there are unknown psychological factors at play. Thus, a promising heuristic for advancing cognitive science by studying the art of magic is to look for tricks which work much better than expected. As an illustration of the application of this research heuristic, I summarize recent research on the illusion of absence. This phenomenon can be described as the compelling visual impression that the space behind an occluder is empty, even when it is not. The phenomenon is similar to amodal completion in the sense that it refers to occluded scene regions and is cognitively impenetrable, but different from amodal completion in the sense that it cannot be explained in terms of the Gestalt principle of good continuation. This phenomenon contributes to explaining how magicians can create powerful illusions where things seem to appear out of nowhere, vanish into thin air, or levitate with surprisingly simple methods. Interestingly, the same illusion may also contribute to our understanding of road accidents where drivers report that other road users seemed to appear out of nowhere. The currently available evidence suggest that the illusion is more likely to occur (1) with narrow occluders and (2) when the motion paths of the occluder and the occluded objects are accidentally aligned. Overall, the findings are in line with Irvin Rock's coincidence avoidance principle. Supported by the Research Council of Norway, project 334817.

Keywords: magic, illusions, amodal completion, illusion of absence, looked-but-failed-to-see accidents

Studying Visual Illusions Through Robotic Perceptual Models

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Robotic and human perception both need to extract complex structures from sensorimotor information in real time. This suggests a possible similarity in computational mechanisms despite differing physical substrates. Motivated by this conjecture, we investigated whether robotic perceptual models could shed light on computational mechanisms underlying human vision. We used Active InterCONnect (AICON), a modeling framework that formulates perception as joint constraint resolution. In other words, it represents perceptual problems as networks of interdependent processes that simultaneously satisfy multiple constraints. To study human vision through AICON, we examined two visual illusions as case studies: the Fill-in Color Aftereffect (Van Lier et al., 2009) and Silencing by Motion (Suchow & Alvarez, 2011). These illusions reveal constraints between shape and color perception, and between luminance and motion perception, respectively. AICON models for these illusions replicated human responses with high fidelity, even capturing individual variability. The results reveal that, when viewed through the lens of AICON's computational mechanisms, surprising diversity in human perception can be attributed to basic model parameters such as time constants for color or motion processing. In essence, we demonstrate through the study of visual illusions that a modeling framework originally developed for robotics can help uncover fundamental mechanisms underlying human perception.

Keywords: Computational modeling, Visual intelligence, Interdisciplinary, Perception, Visual illusions

Psychological Investigations of Human Social Perception in an Artificially Social World

Monday, March 16, 16:30 - 18:00, HSZ - N9

Chair(s): Martin Maier¹, Julia Baum¹

Humboldt-Universität zu Berlin¹

Recent technological and cultural change has introduced new and fast-evolving challenges to social perception and evaluation. Deepfakes, misinformation, artificial agents, and other technologically mediated phenomena pose novel inputs to these systems, and the psychological mechanisms through which perceivers interpret, believe, and evaluate them remain incompletely understood. This symposium examines these issues through the lens of the beholder's share: the extent to which what we "see" in others—including artificial agents—is shaped by predictions grounded in prior knowledge, beliefs, and emotional context. The psychology of the perceiver matters ever more as technologies produce increasingly convincing social signals, such that beliefs and contextual cues—like knowing an image is fake—become distinctive factors in determining their impact. Emotion plays a central role across the five presentations, each addressing how affective meaning interacts with belief and authenticity in social cognition. Julia Baum's talk examines EEG correlates of social evaluation under potential misinformation, identifying neural markers of susceptibility and effective intervention. Alexander Leonhardt investigates how intentionality evoked by affective knowledge and robot appearance jointly shape mind attribution and moral-emotional evaluation of humanoid robots. Martin Maier's presentation explores how emotionally relevant deepfake faces and scenes influence neural responses and evaluations, revealing asymmetries in how positive versus negative content is discounted when believed to be artificial. Annika Ziereis will show behavioral and EEG data examining the processing of naturally photographed or AI-generated facial expressions, evaluating how the actual and perceived authenticity of the emotional cues influences neural and behavioral responses. Finally, Jana Vanek turns to the mechanisms of social-perceptual change itself, showing through EEG studies of meme-like humor how new contextual information can trigger sudden perspective shifts and reorganize social meaning in real time.

Together, these investigations illuminate how emotions, beliefs, and expectations guide perception in increasingly uncertain and often artificially social environments. By focusing on the interplay between psychological processes and cultural-technological transformations, the symposium aims to advance understanding of how humans navigate authenticity, agency, and moral evaluation in a rapidly changing social world.

Keywords: Social perception and evaluation, Emotion and belief, Misinformation, Artificial social agents, Deepfakes, Sudden Insight, Neural mechanisms

Emotion regulation as protection against misinformation biasing brain responses and social judgements

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In today's (online) social world, misinformation reaches people through gossip, social media, and headlines, biasing social evaluations even when people doubt the information. This study tested how explicit emotion regulation can mitigate such biases investigating neurocognitive and behavioural correlates. In the exposure phase of the experiment, participants ($N = 30$, preregistered) were exposed to person-related headlines from well-known German news sources (e.g., Tagesschau, Bild) that they unanimously evaluated as trustworthy or untrustworthy. Participants were reminded that news from untrustworthy sources could be false and that the person may not have acted as described, advising them to react less emotionally to both the person and the headline. In a subsequent judgement phase, participants judged the person presented in isolation while electrophysiological brain responses were recorded. As hypothesised, results showed that positive headlines led to more neutral judgements when the headlines were untrustworthy, with slow evaluative brain responses reflecting the effects of trustworthiness. For negative headlines, the intervention had more complex effects: negative information modulated fast, emotional and arousal-related brain responses only when headlines were trustworthy, whereas slow evaluative responses and social judgements were dominated by negative content regardless of trustworthiness. These findings show neurocognitive and behavioural correlates of how potential misinformation biases social evaluation and how emotion regulation can offer protection. The divergent effects of positive and negative content highlight cognitive mechanisms important for developing better strategies to counter misinformation.

Keywords: source credibility, misinformation, social judgment, reappraisal, EEG, ERP

Neural and Behavioral Correlates of Emotional Face Processing for Genuine and AI-Generated Expressions

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The proliferation of AI-generated facial expressions raises critical questions about how authenticity beliefs shape emotional face processing. This study re-analyzed single-trial EEG data from $N = 40$ participants from Ziereis and Schacht (2024, Scientific Reports) to examine how subjective beliefs about facial expression authenticity interact with neural processing of emotional content. While the original study focused on neural responses to genuine and artificially created emotional facial expressions (happy, angry, neutral) across different stimulus sizes (small, medium, large), the present re-analysis specifically investigated how participants' beliefs about authenticity (real vs. fake) modulated event-related potentials (ERPs). Results revealed that early to late face-sensitive ERP components (P1, N170, EPN, LPC) were affected by the inherent stimulus properties and emotion, but the influence of subjective authenticity beliefs became increasingly pronounced at later processing stages. More consistent modulations emerged within the EPN time window, whereas the LPC exhibited more complex interactions involving both the perceived and inherent authenticity of expressions. These findings suggest that neural responses to faces are shaped not only by facial expressions but also by subjective evaluations of authenticity. This research highlights how authenticity judgments influence social and emotional perception in digital contexts and underscores the need to investigate subsequent neural and behavioral responses, such as memory and mimicry responses to artificial faces.

Keywords: event-related potentials (ERPs), face processing, AI-generated faces, emotion

Seeing Minds in Machines: The Role of Emotion, Appearance, and Presumed Intentionality

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Interactions with artificial intelligence present a challenge for social cognition. Recent technological advances have meant that people engage with artificial agents more frequently, but also that the distinction between human and artificial intelligence is increasingly blurred. It is particularly challenging for people to understand whether they are interacting with a (mindless) machine or an intentional and social being. Several factors may decide in which category agents are placed. This talk focuses on the beholder's share: to what extent do people attribute mind to artificial agents and how does available contextual information and people's traits, beliefs and attitudes affect their perception and evaluation of such technology? I will present findings from two online and two laboratory experiments using EEG that investigated the differential impact of affective knowledge and implied intentionality on the attribution of mind and the moral-emotional evaluation of social robots. Results suggest that both factors affect early perceptual processes as well as moral and emotional judgments. Insights from these studies have implications for human-robot interaction and for ethical questions surrounding the introduction of artificial intelligence into social spheres.

Keywords: social robots, artificial intelligence, social cognition, mind, intentionality, EEG

Perceiving People Who Aren't Real: Neural and Behavioral Responses to Presumed AI-Generated Faces

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As generative AI becomes more widely available, computer-generated “people” that appear deceptively real—so-called deepfakes—are entering our daily lives. The social impact of these stimuli depends not only on their visual quality but crucially on the psychology of the perceiver: how beliefs, expectations, and affective context shape perception and evaluation. This talk presents a series of studies examining how presuming faces to be “real” or “AI-generated” influences neural processing and emotional judgments—first using identical real faces paired with explicit authenticity labels, and later, comparing real and AI-generated faces while measuring participants’ own authenticity judgments. Using EEG and behavioral measures, we investigated how authenticity beliefs modulate early perceptual, semantic, and affective processing of neutral, happy, and angry faces. Complementary behavioral studies extended these findings across all basic emotions, showing that negative compared to positive emotional valence can render social judgments relatively immune against labeling images as fake. Together, these studies illustrate how beliefs about authenticity shape emotional processing beyond the visual input itself, and how emotional content influences the impact of AI-generated social stimuli. These findings connect to the symposium’s broader focus on how emotions, beliefs, and expectations guide perception in technologically mediated social environments, advancing the understanding of how we can navigate contemporary challenges to social cognition.

Keywords: Deepfakes, Face perception, Emotional content, Social cognition, EEG

From Aha to Haha: Sudden Insight, Humor, and the Neural Dynamics of Social Perception

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With the rise of social media and meme culture, new ways of contextualizing social visual stimuli have become ubiquitous. In captioned humor, for instance, a single line can instantly reframe a visual scene and reshape the mental states we attribute to depicted persons. This phenomenon offers a powerful test case for the active, constructive nature of social perception, which flexibly integrates context and acquired meaning. This talk presents an EEG study investigating how sudden insight—and the accompanying experience of funniness—modulate perceptual, semantic, and emotional processing of social stimuli. Across three experimental phases (pre-insight, insight, post-insight), 40 participants viewed images of 120 “memeable” scenes showing public figures. During the insight phase, humorous captions were presented that either matched or mismatched the subsequent image, and participants indicated whether the caption-image pair produced an insight or not. In a separate block, they rated each item’s funniness. Using event-related potentials, we investigated differences between trials with and without sudden insight, including changes in the N170, early posterior negativity (EPN), N400, and late positive component (LPC). New preliminary findings incorporating subjective ratings of funniness explore the relative influences of cognitive insight and affective humor on visual, semantic, and emotional processing as they unfold in real time. These findings highlight the neural mechanisms through which new contextual information can rapidly reshape social meaning. In doing so, they contribute to a better understanding of how emotions, beliefs, and expectations guide perception in an increasingly complex and technologically mediated social world.

Keywords: humor, insight, social perception, EEG

Semantic and Social Aspects of Language Production

Monday, March 16, 16:30 - 18:00, HSZ - 7E02

Chair(s): Kirsten Stark^{1 2}, Rasha Abdel Rahman^{1 2}

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Language production - far from happening in the vacuum - is shaped by socio-emotional and thematic contexts and the goals and qualities of social interactions. This symposium explores how semantic, social, and emotional aspects shape language production at different levels of granularity, from the access to the mental lexicon to free verbal interactions. The symposium kicks off with three talks exploring the continuous naming paradigm, known to induce cumulative semantic interference (CSI), i.e., slower naming with each additional member of a (semantic) category being named. Marisha Herb presents pooled analyses of seven experiments and introduces cosine similarity as a unifying measure to quantify different types of semantic relations. The next two talks use browser-based applications of the same paradigm to examine subtypes of thematic relations that have received comparably little empirical attention so far: Dimitra Tsiapou investigates emotional language production, exploring how emotional action verbs (related to basic emotions happiness, sadness, fear, anger, disgust, surprise) elicit an emotion-specific CSI effect. Annika Speckhahn examines social context in language production, demonstrating how words from associatively related social categories (children's play, conflict, parenthood) shape the CSI effect. Shifting focus to interactive language use, Kirsten Stark presents findings from three online experiments on verbal deception and honesty. She shows that while lying is slower than truth-telling, truth-telling is far from being immune to the social-deceptive context, highlighting the role of planning, control, and monitoring processes involved. Finally, Giusy Cirillo takes a further turn towards real-life interactions and explores how early vocabulary acquirement is shaped by social alignment between toddlers and caregivers: Using a multiphase experimental paradigm with free interaction, referential, and object recognition tasks, she explores how 22- and 30 month-old toddlers' early language acquisition is modulated by the way caregivers adapt their language to the toddler's age and knowledge. Throughout these talks, the symposium aims to showcase innovative experimental, browser-based, and response-time sensitive methods for studying language production in both experimental and real-life contexts and various age groups.

Keywords: Language production, emotion, social context, cumulative semantic interference, language acquisition, deception, typing

Lying and truth-telling in social interaction: Basic mechanisms

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Although deception mostly occurs in the spoken or written language, verbal deception—lying— has received comparably little attention from both deception and language production research. Here we present three pre-registered online experiments (total $N = 118$, aged 18-35) using a novel paradigm to investigate lying and truth-telling in a socially interactive setting. Participants engaged in a picture-naming card game with a simulated task partner, sometimes choosing to lie strategically by producing the name of a card associated with their current card. Across experiments, they were slower to initiate lying than truth-telling, as shown by linear mixed-effects regression models. Interestingly though, response times (RT) and typing durations (analyzed across experiments) of truth-responses were relatively more affected by the social lying context than lie-responses, as shown by a comparison to a control task. In Experiments 2 and 3, we additionally manipulated memory load by displaying the potential lie underneath the current card (Experiment 2) and by comparing semantically related and unrelated truths and lies (e.g., skirt-pants vs. skirt-fork; Experiment 3). Here, lying was more strongly affected by task-associated memory load than truth-telling, but to a similar degree as non-deceptive responses in the control task. Taken together, while underscoring the robustness of RT-slowness in lying, these results hint at a special role of the truth and limited specificity for the effects observed in lying. Indicating influences of planning, control, and monitoring processes, the results can inform and integrate theories of deception and language production. Studying (verbal) lying offers novel perspectives to both research fields.

Keywords: lying, deception, typed language production, online experiments, social context, response latencies

Capturing Cumulative Semantic Interference in Language Production for different Semantic Relations with Cosine Similarity

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Pooling data from previous experiments, we explore the degree of semantic interference elicited by different types of semantic relations in the continuous naming paradigm (taxonomic/categorical, associative, thematic, unrelated). A distributional semantic model estimating semantic relatedness showed that (1) closer relations lead to larger interference; (2) event relations loosely related to a common theme can induce small but robust interference. We provide an estimate of the sensitivity and broad scope of semantic interference in the continuous naming paradigm and show that cosine similarity can be understood as a common measure of different types of semantic relation.

Keywords: cumulative semantic interference, continuous naming paradigm, semantic relations, cosine similarity, distributional semantics

Typing, Speaking, Feeling: Emotional Language Production and Semantic Interference

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Emotional information is central to everyday communication, yet its influence on lexical access during language production remains poorly understood. While cumulative semantic interference (CSI) reliably emerges when naming semantically related items, it is unclear whether emotional categories can elicit similar interference patterns. This project investigates emotional language production across two preregistered online experiments using the continuous naming paradigm. German monolingual participants name AI-generated images depicting positive, negative, and neutral action verbs associated with the six basic emotions (happiness, sadness, fear, anger, disgust, and surprise). The images appear in a seemingly random order to prevent strategic clustering. Following Stark et al. (2022), the first study focuses on typewritten responses, the second on spoken responses, allowing for replication of the effects and comparison across production modalities. By moving beyond conventional semantic relations and employing stimuli grounded in emotional meaning, this research tests whether emotion-based conceptual similarity is sufficient to trigger CSI effects. We predict a cumulative increase in naming latencies within emotional categories, mirroring interference effects previously observed for semantic categories (e.g., Rose & Abdel Rahman, 2016). Demonstrating CSI for emotional categories would provide novel evidence that emotional information is organised in a way that similarly constrains lexical retrieval, suggesting shared underlying mechanisms between emotional and semantic processing during language production. This work contributes to a more comprehensive understanding of language production by integrating emotional dimensions into theories of conceptual activation and lexical selection.

Keywords: language production, emotion, cumulative semantic interference, continuous naming paradigm, typing, speaking, online experiment

Cumulative Semantic Interference for Social Interactive Contexts in Language Production

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Previous research has shown that lexical selection is not only affected by shared semantic features, but also by associative or thematic relations between items (Rose & Abdel Rahman, 2016; Lin, 2022). Additionally, social effects involving communicative partners have been reported in the continuous naming task (e.g., Kuhlen & Abdel Rahman, 2017; Hoedemaker et al., 2017) and other paradigms (e.g., Diveica et al., 2024; Arioli et al., 2021). In the present study, participants named photographs of scenes from 16 social interaction contexts (e.g., children's play, conflict, parenthood) by producing the displayed social actions (e.g., to argue) in a continuous naming task in an online experiment with typed responses. Pilot data shows a significant cumulative semantic interference effect with an increase in response latencies of ~36 ms with each consecutive word from the same social interaction context. For the final dataset and a replication study with spoken instead of typed responses we predict comparable interference effects, which would enhance our understanding of the role of social relations during language production.

Keywords: language production, picture naming, online study, cumulative semantic interference, social semantics

Social interaction and vocabulary learning: An experimental approach to link linguistic alignment and vocabulary outcomes in young children.

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Children acquire language rapidly, yet their development depends on the quality of caregiver input shaped through dynamic, multimodal interactions. This project examines how caregivers adjust their language to children's age and knowledge, and how these adjustments promote learning. To test this, we designed an experiment with two age groups of parent-child dyads. After a phase of free interaction, children and parents engage in a referential game, pairing words for either familiar (frequent) or novel (infrequent) objects with corresponding images. The next day, children complete an object recognition task using the same items. We expect stronger linguistic alignment in younger compared to older dyads, and for novel compared to familiar words, with alignment predicting better vocabulary learning. This work introduces an experimental approach to studying linguistic alignment in parent-child interactions and its contribution to early word acquisition.

Keywords: Parent-child interaction, language development, linguistic alignment, vocabulary acquisition, social cognition, eye-tracking

When the Number Semantics Kicks in: Automaticity of Number Processing and Their Associations With Space

Monday, March 16, 16:30 - 18:00, C-Building - N14

Chair(s): Krzysztof Cipora¹

¹Jagiellonian University, Cracow, Poland

Automatisation is crucial for humans' everyday functioning: it helps release limited cognitive resources and relatively effortlessly process information in a repeatable manner. As a workhorse of cognition, automatisation does not always work to our advantage. If the task requires non-typical actions, automatisation misguides us. Such situations offer a valuable window into the nature of automatic processing and cognition in general. Several domains, including numerical cognition, investigate the automatic processing of certain stimuli to better understand information processing.

In this symposium, we look into how numerical information can be processed automatically when it is not required by task demands. In particular, we discuss how automatically processed semantic information on numbers, specifically their magnitude can be associated with space, and the limitations of these associations in individuals with different math skills levels. While numbers are associated with space in multiple ways (cf. Spatial-Numerical Associations), this symposium explores ways in which semantic information about numbers is triggered while not being required by task instructions, and how this information interacts with spatial processing. First, we discuss whether the well-researched SNARC effect (i.e., association of small / large magnitude numbers with left / right response side), is triggered when asking participants to judge non-semantic features of the stimuli, such as orientation (Talk 1, V. Prpic) or colour (Talk 2, K. Cipora). We also explore whether such effects differ between the general population and professional mathematicians. Following up on links between automaticity of number processing, its spatial associations and their relation to mathematical expertise, we discuss (Talk 3, M. Sroka) how numerical magnitude influences font size judgments (i.e., size congruity effect), and whether these associations differ between professional mathematicians and control groups. Going beyond traditional paradigms with participants seated in front of a computer screen, we look into whether generating random numbers, which does not require magnitude processing per se, affects spatial decision making in virtual reality (Talk 4, M. Murgia). We conclude with a talk about breaking the automaticity of S-R mappings in the SNARC effect and whether this makes the SNARC more predictive of math abilities (Talk 5, J.-P. van Dijck).

Keywords: Numerical cognition, Automaticity, Spatial-Numerical Associations, SNARC, decision making, math expertise, size congruity effect

Judging colors, processing and spatialising magnitudes: The SNARC effect in the color judgment task

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¹Mathematical Cognition and Learning Lab, Copernicus Center for Interdisciplinary Studies, Jagiellonian University, Krakow, Poland

Numerical magnitude is associated with space. The Spatial-Numerical Association of Response Codes effect (SNARC; i.e., faster left-/right-sided responses to small/large numbers respectively) is a hallmark example of such associations. Interestingly, the SNARC effect arises not only when participants are to process magnitude of numbers (e.g., in parity judgments). Further studies revealed SNARC effect even when no number semantics need to be processed to complete the task. However, evidence from such tasks remains mixed. Especially, studies using color judgment tasks (i.e., participants judge the color of fonts of numbers being presented) brought diverging results. In a large-scale online study (Roth et. al., 2025), we found a SNARC effect in two color judgment experiments (blue vs. yellow and light blue vs. dark blue). The group-level effects were small. An individual level analysis revealed a sizeable proportion of participants revealing a reliable reversed effect (faster right/left responses to small/large numbers, respectively). In a follow-up study, we used the same blue vs. yellow setup, and tested professional mathematicians (i.e., individuals enrolled in doctoral studies in mathematics) and matched controls (i.e., individuals matched in their educational level). Preliminary results (with sample tested up-to-date), indicate that even though we did not find a group-level effect neither overall nor separately in any of both groups, more mathematicians than controls were characterised by a reliable reverse SNARC effect. All this indicates that numerical magnitudes are automatically processed in such setups, but the direction of spatial association of these magnitudes may differ from one revealed in other tasks.

Keywords: automaticity, SNARC, Spatial-Numerical Associations, numerical cognition

Orientation judgment and the SNARC effect: Investigating the Neural Overlap Hypothesis and automatic number processing

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The neural overlap hypothesis (Fias et al., 2001) suggests that magnitude information is automatically extracted from digits whenever there is sufficient neural overlap between the systems involved in processing relevant and irrelevant features. Because numerical information is primarily processed in parietal regions, a visual feature that strongly engages these areas—such as orientation—should interact with number magnitude. Conversely, such an interaction should be minimal when processing features with little parietal involvement, such as colour. This prediction aligns with previous findings showing a SNARC effect during orientation judgments but only limited evidence during colour judgments. Despite the influence of the neural overlap hypothesis, only a few studies have attempted to replicate the original results. In the present work, we sought to replicate a key experiment introduced by Fias and colleagues (line orientation judgment), testing both digits and letters. Based on the neural overlap account, a SNARC effect should emerge only for digits, and should be weak or absent for letters, given their differing degrees of overlap with parietal structures. Across two experiments conducted both online and in the laboratory, we consistently failed to observe a SNARC effect for either numbers or letters. An aggregated analysis of 155 participants confirmed the absence of the effect. Our findings challenge the neural overlap hypothesis and suggest that, in non-semantic tasks, only a small SNARC effect might be detected by testing very large sample sizes, as recently shown in studies using colour judgment.

Keywords: Spatial-Numerical Association, Neural overlap, Orientation, Automaticity

When Numerical and Physical Magnitudes Compete: Insights from the Size Congruity Task in Professional Mathematicians

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Automatic processing of numerical magnitude is commonly examined using the Size Congruity (Numerical Stroop) Task, in which numerical value can facilitate or interfere with judgments of the physical size of numbers. The present study investigated whether expert mathematicians (PhD students/PhD holders with an MSc in mathematics) differ from matched controls in strength of this automatic processing. Participants viewed pairs of digits that differed in both numerical value and physical size and indicated which digit was physically larger while ignoring numerical value. Trials were either congruent (numerically smaller number written in smaller font than the numerically larger number) or incongruent (numerically smaller number written in larger font than the numerically larger number). Preliminary results (a subset of the target sample tested to date, $N = 73$, including 39 mathematicians) showed high overall accuracy ($97.9\% \pm 2.2\%$), with higher values for congruent ($98.5\% \pm 1.7\%$) than incongruent trials ($97.3\% \pm 2.5\%$). Accuracy did not differ between mathematicians ($97.9\% \pm 2.3\%$) and controls ($97.8 \pm 2.1\%$), and groups did not differ in the magnitude of the congruency effect. Reaction-time analyses showed a similar pattern: participants were significantly faster on congruent than incongruent trials, but neither the main effect of group nor the interaction reached significance. The Size Congruity effect was present in both groups in terms of accuracy and reaction times, indicating that automatic numerical information, even when task-irrelevant, is processed similarly by mathematicians and controls. These preliminary findings do not support the hypothesis that mathematical expertise affects strength of the Numerical Stroop effect.

Keywords: numerical cognition, Size Congruity effect, math expertise

Are spatial decisions influenced by number magnitude? Evidence for Spatial–Numerical Associations in complex movements within a VR environment

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The Spatial-Numerical Association of Response Codes (SNARC) effect refers to the spatial mapping between numerical magnitude and response side, with smaller numbers typically linked to leftward responses and larger numbers to rightward ones. While this effect is commonly observed through RT differences in simple key-press tasks - such as magnitude classification or parity judgment - our study examined whether comparable spatial biases emerge in decisions involving more complex motor actions, specifically walking. In a virtual reality environment, participants viewed a number from 1 to 9 displayed directly in front of them. At the start of each trial, they processed either the number's magnitude (Experiment 1) or its parity (Experiment 2) and were then instructed to walk freely in any direction toward a semi-circular target area while maintaining the relevant information in working memory. Across both experiments, participants showed a higher tendency to walk leftward in response to smaller numbers and rightward in response to larger ones, revealing a spatial bias consistent with the SNARC effect. These results demonstrate that, in a free-response task, walking direction is systematically influenced by numerical magnitude, regardless of whether magnitude is explicitly relevant to the task.

Keywords: SNA, SNARC, spatial decisions, VR, walking, numbers

Strengthening the SNARC effect through dynamic stimulus-response-mapping: A preregistered study

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The SNARC effect, typically measured with magnitude comparison or more commonly with parity judgment tasks, is robust at the group level yet markedly variable across individuals. We propose that its reported size and robustness underestimate its true value. In standard tasks, participants rapidly learn automatic number–response associations (e.g., 1→left, 2→right), enabling performance without activating magnitude information or its spatial associations. To prevent such automatic mapping, we conducted a preregistered study ($N = 64$) using a parity judgment task in which the response mapping switched randomly on every trial. This design was intended to block stimulus–response learning and enforce continuous reactivation of magnitude–space links. The switch condition yielded a clearly enlarged SNARC effect, largely attributable to a scaling factor arising from prolonged response latencies. Importantly, the proportion of individuals showing a consistent SNARC pattern remained stable, indicating that dynamic task demands modulate effect size but not the distribution of SNARC-consistent responders. This aligns with the assumption that cognitive control and stimulus–response learning attenuate effect magnitude but do not obscure its presence. Participants also completed a mental arithmetic speed task. Given prior inconsistent findings linking SNARC and arithmetic, we expect any true relation to emerge when automatic mappings are disrupted. A final analysis examines the specific impact of mapping switching versus repetition trials, with the targeted prediction that the SNARC effect will be more pronounced under switching, consistent with reduced learning opportunities and stronger reliance on magnitude-based spatial processing.

Keywords: spatial numerical associations, SNARC, cognitive control, automaticity, stimulus-response mapping

Task Set Control in Multitasking: Insights From Task Switching and Dual-Tasking

Tuesday, March 17, 09:00 - 10:30, HSZ - N1

Chair(s): Alexander Berger¹, Patricia Hirsch²

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Multitasking is a frequent part of everyday life, requiring us to switch between different tasks or engage in multiple tasks simultaneously. Such situations place high demands on cognitive control. A key aspect of this control is the regulation of task sets: internal representations that guide behavior in accordance with current task demands. Using task switching, probe task and dual-tasking methods, this symposium brings together different paradigms for investigating the flexible control of task sets, thereby integrating different perspectives on the preparation, inhibition, and adaptation of task sets. We present studies on how task sets are shaped by anticipatory processes, how they may be suppressed to reduce interference, and how control mechanisms flexibly adjust based on recent experience or contextual demands. The individual talks address a range of questions within this framework: one study investigates inhibitory processes triggered by mere task preparation; another explores how changes in cue-task mappings affect reconfiguration after practice. A third contribution examines the origins of asymmetries in task switching involving different perspectives. Extending the focus to situations involving overlapping task demands, further talks investigate the dissipation of dual-task representations and how sequential demands modulate control in dual-task settings. Together, the symposium provides an integrative perspective on the dynamic regulation of task sets and aims to advance our understanding of the cognitive mechanisms that support cognitive flexibility and efficient multitasking in complex environments.

Keywords: cognitive control, task set, task switching, dual tasks, preparation, inhibition, sequential adaptations

Task set inhibition following mere task preparation induced by cue-only trials

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One mechanism considered to aid the switch between tasks is the inhibition of previous, no longer required task sets. Recently, n-2 repetition costs – a marker of such inhibitory processes – were observed following a cue-only trial, in which only the task cue, but no actual task was presented. This indicates that merely preparing for a task activates a task set, which is inhibited during the switch to a new task. In the present work, we investigate the influence of the cue duration (cue-target interval; CTI) on such inhibitory processes following cue-only trials (long CTI: 750ms; short CTI: 300ms). The CTI was previously shown to reduce switch costs, indicating that participants use longer cue durations for more in-depth task preparation. However, in the present work, whilst robust n-2 repetition costs following cue-only trials were observed, these costs were not significantly moderated by CTI. This suggests that different levels of task preparation result in a conflict between competing task sets, with inhibition as a mechanism to resolve this conflict.

Keywords: task set, task switching, preparation, inhibition, n-2 repetition costs

Partial reversal of cue-task assignment after task switching practice

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¹MSH Medical School Hamburg, Germany

Task switch costs are typically reduced following task switching practice, likely reflecting increased efficiency in task-set reconfiguration. In the task cueing procedure, assuming the formation of cue-task associations, the reduction in switch costs after practice can be attributed to cue-based automatization of task-set reconfiguration processes. We investigated the effects of practice for cue-based task-set reconfiguration by partially reassigning the cue-task assignments for a subset of cues after extensive task switching practice. Specifically, performance with reassigned cues in task repetition and task switch trials was compared to performance with cues that retained their original task assignment. In doing so, the use of a 4:2 cue-task mapping allowed us to disentangle task switch costs from cue switch costs. Cue reassignment lead to increased performance costs relative to both constant and novel cues introduced only after practice , indicating a relearning cost associated with previously established associations. Importantly, this relearning cost was not greater in task switch trials than in task repetition trials, suggesting that cue-based automatized task-set reconfiguration, if it occurs, disrupts ongoing performance in a broader way rather than specifically interfering with the additional reconfiguration demands of task switches.

Keywords: task-set reconfiguration, task switching, practice

Elaborating sources of a switch cost asymmetry when switching between first-person and third-person perspectives

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Asymmetrical switch costs (i.e., larger costs of switching from a “weaker” to a “stronger” task than vice versa) have been attributed to inhibition of a dominant competitor set (i.e., cognitive control account), task-specific consumption of cognitive resources (i.e., sequential difficulty account), or differential susceptibility to (long-term memory-based) interference in task repetition trials due to task-set competition (i.e., associative interference account). We investigated the source of asymmetrical switch costs of when switching between laterality judgments made from a third-person perspective (3PP) vs. from a first-person perspective (1PP) by means of a probe task method. Specifically, we intermixed trials of a Simon task to examine inhibition of the “direct route” (as a process associated with the inhibition of the dominant 1PP) – assumed to activate response codes that spatially correspond with stimulus laterality according to the 1PP – and to compare resource consumption on 1PP and 3PP trials. Moreover, intermixing trials of the Simon (probe) task allowed us to analyze interruption costs (i.e., 1PP and 3PP task performance following a Simon task trial). We observed asymmetrical switch costs with larger costs when directly switching from the 3PP to the 1PP task. Simon task performance provided no clear evidence for inhibition of the direct route or for larger resource depletion after 3PP trials. Comparing 1PP and 3PP performance after Simon task trials revealed asymmetrical interruption costs comparable to the switch cost asymmetry, however, a result uniquely predicted by the associative interference account.

Keywords: asymmetrical switch costs, interruption costs, perspective taking, associative interference, probe task

Does Timing Matter? Exploring the Temporal Dynamics of Dual-Task Representations

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In research on cued task-switching, increasing the time interval between a response and the cue onset of the upcoming trial (response-cue interval; RCI) typically leads to reduced switch costs. This effect is usually attributed to the dissipation of the previously activated task set: longer RCIs allow more time for the previous task set to dissipate, thereby reducing interference when a new one must be activated. The present study examined whether a similar time-dependent effect occurs for task-pair sets, higher-order representations of two partially overlapping tasks in dual-task contexts. To this end, we applied the task-pair switching logic, in which each trial began with a cue indicating which of two partially overlapping task-pairs to perform and then proceeded as a psychological refractory period (PRP) trial. Task 1 remained constant across pairs (A: tone task), whereas Task 2 varied (B or C: visual tasks). We manipulated the interval between the stimuli onset of Task 1 and Task 2 (stimulus onset asynchrony; SOA), the task-pair sequence (switches, e.g., AB → AC, vs. repetitions, e.g., AB → AB), and the RCI from the response in Task 2 to the cue for the next trial (short vs. long). Data from 48 participants revealed significant effects of SOA and task-pair sequence in both tasks, with poorer performance on task-pair switches than repetitions. Crucially, task-pair switch costs in reaction times were reduced at longer RCIs, in line with the dissipation account. These findings provide new insights into the temporal dynamics underlying the control of dual-task representations.

Keywords: dual tasks, task-pair switching, task-pair set, response-cue interval, PRP effect, dissipation

Independent mechanisms of cognitive control in dual-task settings: Evidence from task-pair sequence and response-conflict manipulations

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In dual-task situations, the two component tasks are assumed to be represented jointly within a single cognitive representation, termed task-pair set. Switching between task-pairs typically incurs performance costs, reflecting the need to reconfigure the active task-pair set or to overcome proactive interference. Recent findings have shown that these task-pair switch costs are smaller after a task-pair switch than after a task-pair repetition, reflecting a sequential modulation of task-pair switch costs. The present study investigated whether this modulation is influenced by adaptive control adjustments to response-level conflict. To this end, we varied the proportion of incongruent trials within a block. Incongruent trials required spatially distinct responses in the component tasks, whereas congruent trials required spatially overlapping responses. We replicated the standard task-pair switch costs and their sequential modulation. However, neither effect was influenced by the proportion of incongruent trials. This finding suggests that when participants engage more proactive control to handle frequent response conflicts, task-pair set control remains unaffected. Thus, adaptive control over response conflict and task-pair selection appear to rely on independent mechanisms.

Keywords: cognitive control, dual tasks, task-pair switching

Dynamics of Human - AI Interaction: Longitudinal Insights into Delegation, Trust, Perceived Closeness, Credibility, and Cognitive Self-Esteem

Tuesday, March 17, 09:00 - 10:30, HSZ - N2

Chair(s): Teresa Luther¹

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The increasing integration of artificial intelligence (AI) into everyday life - through local large language models, multimodal assistants, and personalized system designs - raises essential questions about how people perceive, trust, and interact with AI systems over time. This symposium brings together findings from an interdisciplinary longitudinal study investigating the perception and dynamics of human - AI interaction across six measurement points within one year. The project explores how individual characteristics, behavioral responses, and usage contexts jointly shape willingness to delegate to AI - both in writing and decision-making contexts - as well as perceptions of trust, credibility, closeness, and self-efficacy. The first contribution presents data from the initial wave of data investigating predictors of individuals' willingness to delegate writing tasks to AI. The second contribution investigates how trust and related perceptual facets—credibility, creepiness, and mind perception—shape people's willingness to delegate decision-making to AI systems over time. The third contribution addresses perceived closeness and behavioral intention, examining how perceptions of AI agents as social actors—rather than mere tools—change over time and how these changes relate to feelings of loneliness, perceived intelligence, and behavioral intentions to use AI. The fourth contribution examines how perception of AI as tool or social actor and interaction modality (text vs. voice) shape credibility perceptions. Finally, the fifth contribution examines whether the perception of AI as tool vs. social actor also has consequences for cognitive self-esteem of the user, also over time. Together, these studies provide a comprehensive perspective on the evolving relationship between humans and AI. By integrating psychological, social, and technological viewpoints, the symposium offers novel insights into how trust, roles, and self-perceptions adapt to increasingly intelligent and omnipresent AI systems - highlighting implications for user-centered and ethically informed AI design.

Keywords: Human-AI interaction, longitudinal study, delegation, trust, credibility, closeness, cognitive self-esteem

Handing Over the Pen? How Perceptions of AI Shape Willingness to Delegate Writing Tasks

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The widespread adoption of artificial intelligence (AI) is reshaping human-AI collaboration, with AI systems increasingly augmenting human capabilities in automating tasks and optimizing workflows (Langer & Landers, 2019). AI delegation, as a distinct aspect of human-AI collaboration, has the potential to alleviate human effort in time-consuming tasks and enhance efficiency (Westphal et al., 2024). A key question is which factors influence people's willingness to delegate tasks to AI. Prior research points to user-related and context-related determinants but rarely examined specific task types. Considering recent meta-analytic evidence of performance gains from human-AI synergy in content-creation tasks (Vaccaro et al., 2024) and the increasing use of AI for writing, understanding what influences people's decisions to delegate tasks to AI in this context is crucial. As part of a longitudinal study on the dynamics of human-AI interaction over time, this contribution presents analyses from the first wave of data collection. Using a US-based online sample ($N = 1007$), participants indicated their preferred level of AI assistance for eight randomized writing tasks covering personal and professional contexts on a four-point scale, adopted from Lubars and Tan (2019). Multiple linear regressions were performed to identify significant user-, perception-, and task-related predictors of delegation willingness. Findings revealed that perceived trustworthiness and anthropomorphism significantly predicted greater willingness to delegate writing tasks to AI. In contrast, perceiving AI as a social actor or as intelligent did not.

Keywords: conversational agents, human-AI interaction, delegation to AI, writing, user perceptions

From Creepiness to Delegation: Longitudinal Trust Dynamics and Adoption of AI

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People increasingly hand important decisions to AI, yet we know little about how day-to-day shifts in perception translate into real delegation and adoption. I present preregistered analyses from a six-wave U.S. panel ($N = 1,007$ at Wave 1; $N = 434$ at Wave 6; ~2-month lags) that followed participants' "favorite LLM based AI" from late 2024 to mid-2025. At each wave, we measured perceived usefulness and creepiness of that AI, trust in it, willingness to let AI systems make decisions, and behavioral intention to delegate concrete tasks. Wave-6 outcomes capture adoption (number of AI-completed tasks, intention to increase delegation) and perceived side effects (impact on one's skills, adaptation, anxiety, ethical concern). Using person-mean-centered mixed models, we test (a) whether within-person changes in usefulness and creepiness forecast next-wave trust, (b) whether trust shifts predict subsequent delegation attitudes and intentions, and (c) whether earlier delegation intentions translate into later adoption. We probe negativity asymmetry ("do losses hurt more than gains?"), nonlinear thresholds in the trust-delegation link, and indirect chains such as creepiness $\rightarrow$ trust $\rightarrow$ delegation and trust $\rightarrow$ delegation $\rightarrow$ adoption. The talk highlights when and how small changes in people's everyday experiences with AI snowball into broader adoption, and when they instead trigger withdrawal and concern.

Keywords: AI trust, creepiness, task delegation, adoption, longitudinal panel

From Tools to Companions? How Does Tool-Actor Perception Shape Relational and Behavioral Dynamics Over Time?

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Conversational agents are becoming increasingly advanced and humanlike. As their abilities improve, people may begin to perceive them not only as tools but also as companions or social partners (Cheng et al., 2025). Individuals often form and strengthen relationships with AI systems (Skjuve et al., 2023). Yet, little is known about how these perceptions change over time. This six-wave longitudinal study examined whether users' perceptions of AI agents (tool vs. social actor) shift over time and how these shifts relate to interpersonal closeness, loneliness, and behavioral intention to use AI tools (Ntotal = 1007). We predicted that perceptions would increasingly favor "social actor" and that this shift would be linked to higher perceived intelligence, greater closeness, and stronger intentions to use AI. Contrary to expectations, people increasingly viewed the agent as a tool rather than a social actor over time, with "social actor" responses decreasing across waves. Loneliness at T1 did not predict role trajectories. Cross-sectionally, those viewing AI as a social actor rated it as more intelligent than those viewing it as a tool, but this association did not strengthen over time. Perceived role did not influence interpersonal closeness across waves. Behavioral intention to use AI started high but declined over time (with a small quadratic uptick), independent of role perceptions. These findings suggest that even as AI systems become more anthropomorphic, users continue to approach them primarily as functional tools rather than social companions.

Keywords: conversational agents, loneliness, closeness, intention to use, intelligence, companion, longitudinal

Tool or Social Actor? How AI Perception and Preferred Modality Influence Perceived Credibility of AI Over Time

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People increasingly interact with conversational agents based on artificial intelligence (AI) for a variety of tasks. While these systems often produce responses that are natural and engaging, the provided information is not always correct and unbiased. This makes it essential to understand how users perceive the credibility of such systems. Drawing on data from four waves of a longitudinal survey (N_T1 = 617, N_T4 = 485), we investigate how active users' perception of AI as a tool or social actor and their preferred interaction modality (text vs. voice) influence users' credibility perceptions of language-based AI systems, both cross-sectionally and over time. We found that, within each wave, social presence, enjoyment, and perceived intelligence mediated the impact of tool-social actor perception but not modality on perceived credibility. A random-intercept cross-lagged panel model (RI-CLPM) did not support mediation effects at the within-person level over time. Our study contributes to the field of Human-Machine Communication with novel longitudinal insights into the psychological mechanisms that shape users' credibility judgements of AI systems.

Keywords: credibility, social presence, enjoyment, perceived intelligence, modality, artificial intelligence, conversational agent

Communicative AI as Extended Mind: Relationships between AI Perception and Cognitive Self-Esteem

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Prior research has shown that people mistakenly regard the Internet's knowledge as their own and report higher cognitive self-esteem after using Google to answer questions than without using Google. Experimental work showed that this effect does, however, not occur when people interact with a chatbot. Building on this, we examine whether this effect is only short-lived or occurs in the field among regular users of communicative AIs (ComAIs) like ChatGPT or Alexa. More importantly, we examine the impact of people's perception of ComAI as tool vs. social actor and their usage modality (text, voice). Using data from a six-wave longitudinal study among active ComAI users, we tested the following hypotheses: H1: People who perceive communicative AI as a social actor show lower cognitive self-esteem than people who perceive AI as a tool. H2: The effect postulated in H1 is stronger the more people interact with the AI via voice. H3: People who perceive AI as social actor (vs. tool) at time t1, show lower cognitive self-esteem at time t+1. No significant effect of perception (tool vs. actor) on cognitive self-esteem, and no interaction with modality emerged. In some waves, a modality effect occurred: people who used ComAI via voice and text reported the highest cognitive self-esteem.

Keywords: communicative AI, cognitive self-esteem, actor vs. tool, longitudinal, extended mind

The Relevance of Affective Information for Cognitive Control Processes

Tuesday, March 17, 09:00 - 10:30, HSZ - N3

Chair(s): Tara Radovic¹, Leif Erik Langsdorf¹

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Goal-directed behavior relies on cognitive control, involving processes such as goal processing and maintenance, managing conflict, as well as flexible adaptation to changing contexts. By now, it is well established that the processing of multiple goals leads to processing costs. Moreover, evidence from evolutionary and cognitive science indicates that the affective relevance of external stimuli influences the allocation of processing resources, the recruitment of attention, and ultimately guides behavior. While it is agreed upon that affect can modulate the allocation of attention and (neuro-)cognitive resources for information processing, the influence of the affective relevance of information on different cognitive control processes requires further study. This symposium explores how the affective relevance of information influences cognitive control across different cognitive control tasks. These tasks include working memory tasks, reactivating goals after interruptions, switching between different goals, and managing interference. The symposium will draw on diverse methodological approaches, such as behavioral studies, neurophysiological measures, and a meta-analysis. The selected talks feature diverse affective materials and examine varying degrees of affective relevance for response selection in the selected paradigms. Plancher et al. show that negative emotion influences both processing and attentional maintenance in working memory, supporting models that propose an attentional trade-off between these two components. Radovic and Schubert examine how affective interruptions influence goal decay and reactivation of goals when resuming a task after an interruption. Langsdorf et al. demonstrate that processing asymmetries between neutral and affective tasks modulate intentional processes, i.e., the decisions select either task. Pourtois shows that value processing is not automatic but modulated by goal relevance, with EEG evidence indicating an early, perceptual locus for this effect, supporting models in which value and goals flexibly interact to guide information processing. Finally, in a meta-analysis, Dignath et al. show how task-irrelevant emotions impact performance in conflict tasks and proposes an integrative framework suggesting that emotion influences control through distinct mechanisms depending on valence, arousal, and processing stage. Together, this symposium aims to foster discussion and provide a synthesis on how the affective relevance of information impacts different aspects of cognitive control processes in challenging task conditions.

Keywords: Affective relevance, Goal-directed behavior, Working memory, Cognitive flexibility, Task-interruptions

Modulation of Maintenance and Processing in Working Memory by Negative Emotions

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Previous research has shown that working memory processes are affected by emotion. However, it is not clear if both components – maintenance and processing of information – are modulated by emotion. Some theoretical models assume that working memory is a unitary system, resulting in a perfect trade-off between maintenance and processing. If this is true, we should observe that processing emotional information affects memory performance and that maintaining emotional stimuli affects the processing of neutral information. Since emotion is intimately related to attention, we focused on attentional maintenance. In several experiments, using complex span tasks, we observed lower recall when negative stimuli were processed compared to neutral ones and longer processing times when series of negative stimuli were maintained. Overall, our results showed that emotion impacts both processing and attentional maintenance in working memory. This is consistent with models of working memory suggesting an attentional trade-off between maintenance and processing.

Keywords: Working memory, emotion, maintenance, processing

Interrupting with bad news: effects of emotional interruptions on resumption of a serial, multistep task

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Resuming a serial, multistep task after an interruption requires maintaining the relevant task goals during the delay and retrieving them afterward. While current theories of interruptions do not consider the role of emotions in these goal maintenance and retrieval processes, prior work in the working memory domain suggests that affective content can impair the maintenance of memory items, whereas memory for item order remains unaffected. The present study tested whether this pattern of an affective influence also applies to goal retrieval following interruptions. Participants completed an affectively neutral, multistep primary task and were occasionally interrupted between steps. Interruptions consisted of either semantic categorization tasks (judging whether a displayed picture showed a human or an animal) or recognition tasks (judging whether a picture was old or new). The interruptions varied in length (short vs. long) and affective valence (negative vs. neutral), and the affective content was irrelevant to the task. After each interruption, participants were required to resume the primary task at the correct step. Resumption performance was assessed using response times and sequence errors, defined as deviations from the correct step order (e.g., skipping or repeating steps). Preliminary results indicate longer resumption times following affectively negative interruptions than neutral ones, particularly when the interruptions were long. In contrast, affective valence did not influence the number of sequence errors. The findings align with the hypothesis that affective stimuli require additional attentional resources, leaving fewer working memory resources available for maintaining task goals, and thereby slowing goal retrieval during the task resumption.

Keywords: affective interruption, goal-maintenance, sequence errors, resumption times

Neural Correlates of Asymmetric Switch Costs during Affective Task Switching

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Task switching is widely used to investigate cognitive control, typically revealing switch costs reflected in increased response times in switch compared to repetition trials. Previous research reported larger costs when switching towards an affective task, compared with a switch towards a neutral task. This asymmetry can be explained by the inhibition of the affective task, which enables the performance of the neutral task. So far, we lack a clear understanding of how this affective processing asymmetry is neurally implemented. In Experiment 1, we therefore examined whether affective task content interferes with the initiation of the switching process, before stimulus onset, as reflected in preparatory event-related potential components. In Experiment 2, we investigated whether the maintenance of task sets is likewise modulated by affective task content, as reflected in neural mixing costs (repetition – single-task performance). Therefore, we asked participants to complete a cued task-switching during electroencephalographic recording, judging either the gender (neutral-task) or emotional expression (affective-task) of faces. For Experiment 1, neurally, within the cue-stimulus-interval, the switch-related posterior positivity was reduced in the affective compared to the neutral task, coinciding with increased switch costs toward the affective task. This suggests that affective task content interferes with preparatory processes before stimulus onset. For Experiment 2, neurally, within the cue-stimulus interval, the mixing-related centroparietal positivity remained unchanged by affective task content, mirrored behaviourally by symmetrical mixing costs. These findings indicate that affective task content selectively interferes with the initiation of the switching process before stimulus onset but not with maintaining the task-sets.

Keywords: Control Processes, Affect, Event-Related Potentials

Behavioral and neurophysiological effects of goal relevance on emotional processing

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According to influential models in psychology and affective sciences, value can be processed irrespective of goals, and it can even hijack them in some circumstances, leading to distraction, errors or maladaptive behavior for instance. However, more recent goal-directed theories (e.g. Moors et al., 2017) emphasize the importance of goals for information processing, and the fact that value actually depends on or results from them. In this talk, I will present behavioral and EEG/ERP results from a series of lab studies we have conducted where we examined the influence of goal relevance on value processing. Either performance monitoring (i.e. assigning value to self-generated actions) or selective attention (i.e. assigning value to specific stimuli or spatial locations in the visual field) was the main cognitive process under consideration in these studies. For both of them, we consistently found that value processing was not automatic, but modulated by the goal relevance of emotion. Moreover, using ERPs, we found that this modulation occurred early following stimulus onset, revealing a perceptual locus for it. These results can be interpreted using recent computational accounts according to which value is one type of information that can be used together and in a flexible manner with goal to guide the active sampling of the environment.

Keywords: Goal, value, attention, performance monitoring, EEG

Affective Control in Conflict Tasks: A Meta-Analysis and a Tentative Integrative

David Dignath^{1*}, Felix Cramer^{1*}

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Emotions influence how we control our thoughts and actions, but theories propose different mechanisms and make opposing predictions how valence and/or arousal modulate control exertion. This meta-analysis of 34 studies (72 experiments, $N = 3,748$) examined whether and how task-irrelevant emotional stimuli influence the congruency sequence effect (CSE), a widely used measure of control in conflict tasks like Stroop. Overall, results showed increased CSEs following negative compared to positive stimuli across a variety of different experimental procedures. This negativity-boost for control was stronger in studies that used tonic (sustained) affect inductions, presented non-threatening stimuli, controlled for feature-binding confounds, and employed the flanker task. In contrast, arousal showed opposing effects depending on the overlap between emotional and task stimuli, as well as the format of the emotional stimuli—for example, high-arousing words or stimuli embedded within the task appeared to facilitate control. To account for these findings, a tentative integrative framework is proposed, combining elements from several existing models. The framework assumes that emotional stimuli impact on cognitive processing at different stages (early vs. late), via different mechanisms (attentional bias vs. control adjustment), and through different qualities.

Keywords: Cognitive control

Part I: Advancing Diffusion Decision Modeling: From Theoretical Extensions to Computational Innovations

Tuesday, March 17, 09:00 - 10:30, HSZ - N4

Chair(s): Nicola Schneider¹

¹Heidelberg University, Germany

The diffusion decision model (DDM) is a mathematical framework that jointly describes choice behavior and response time distributions, offering a process-level account of decision-making. Conceptualizing decisions as the accumulation of noisy evidence, the DDM has provided insights into the cognitive mechanisms underlying perception, attention, memory, and higher-order decision-making. Its flexibility and explanatory power have made it one of the most widely used tools in experimental psychology, bridging cognitive theory, mathematical modeling, and empirical research. The increasing prominence of DDMs has spurred both conceptual and methodological developments. This symposium focuses on recent theoretical and computational advancements in the modeling of DDMs, including advances in estimation techniques, alternative stochastic dynamics to the Wiener process, and integrations with other modeling frameworks. Together, we aim to highlight new directions for enhancing theoretical and conceptual precision, modeling flexibility, and computational efficiency. This symposium is the first part of a two-part series on DDMs at TeaP. While Part I emphasizes model development, theoretical extensions, and computational innovation, Part II turns to applied research, demonstrating how DDMs can help us better understand cognitive processes across different populations and domains. By being open to scholars from all areas of experimental psychology, the series offers a forum for presenting new ideas, establishing collaborations, and identifying future directions in the modeling of human cognition.

Keywords: DDM, diffusion decision model, cognitive modeling, mathematical modeling, response time modeling, Bayesian modeling, computational modeling

Using pairwise estimation for diffusion model parameters: A comparison between Stan and BayesFlow

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The drift–diffusion model (DDM) is widely used in psychology and neuroscience to decompose the cognitive processes underlying decision making. Many research scenarios require rapid or repeated estimation of DDM parameters, such as analyzing large-scale datasets, conducting simulation-based power analyses, or implementing adaptive experimental designs. In these settings, the same model must be fitted many times across datasets or conditions, making amortized Bayesian inference methods (e.g., BayesFlow) an appealing alternative to traditional MCMC approaches. However, the high training cost and limited generalizability of amortized inference can restrict its applicability across different experimental designs. Composite likelihood provides a promising strategy to increase generalizability and reduce computational burden by approximating the full likelihood with likelihoods defined over subsets of the data. A simple and effective variant is pairwise composite likelihood, where likelihoods are computed over every unique pair of conditions rather than jointly across all conditions. This reduces training effort while preserving the fast amortized inference that BayesFlow offers. To evaluate this approach, we conducted parameter recovery studies using simulated data from simple DDMs, comparing composite likelihood with full likelihood estimation in both BayesFlow and Stan (as a benchmark). Results show that composite likelihood achieves parameter recovery comparable to full likelihood in both frameworks. Crucially, composite likelihood in BayesFlow greatly reduces inference time relative to Stan, offering a scalable and efficient solution for repeated DDM estimation.

Keywords: Cognitive modeling, diffusion model, composite likelihood, simulation-based inference

Lévy Flights vs. Self-Elicitation: Competing Accounts of Speed–Accuracy Trade-Offs in Evidence-Accumulation Models

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In evidence-accumulation models, speed–accuracy settings are typically modeled by adjusting boundary separation. Numerous studies have shown that speed instructions lead to lower boundaries, indicating that decisions are made based on smaller amounts of accumulated information (i.e., liberal settings), whereas accuracy instructions lead to higher boundaries, requiring more information for a decision (i.e., conservative settings). However, recent research challenges the idea that boundary separation alone is sufficient to explain behavior under speed versus accuracy instructions. The Lévy Flight Model assumes more pronounced guessing tendencies—reflecting less stable evidence accumulation—under speed instructions. Another approach, based on an Ornstein–Uhlenbeck process, suggests a tendency toward self-elicitation in evidence accumulation following speed instructions. In the present talk, I will compare both accounts and test whether they can be empirically distinguished.

Keywords: diffusion model, evidence-accumulation model, Lévy Flight, Ornstein–Uhlenbeck process, speed–accuracy settings

Toward a Mechanistic Account of Cognitive Inhibition: Integrating Computational Modeling and Psychometrics

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Inhibition plays a central role in explaining how individuals resolve conflict during decision making. Traditionally, research has estimated inhibition using reaction time (RT) differences between congruent and incongruent conditions in conflict tasks (e.g., Simon, Flanker, and Stroop tasks). However, this approach overlooks accuracy information and conflates inhibition with other processes such as processing speed and non-decision time. To address these limitations, we adapted the Competing Accumulators (CA) model to quantify cognitive inhibition—the ability to suppress task-irrelevant or conflicting information—within a formal decision-making framework. Our new model provides a cognitively grounded and psychometrically coherent method that disentangles inhibition from other cognitive processes. Combining computational modeling and structural equation modeling (SEM) across multiple conflict tasks, we tried to identify a coherent latent inhibition factor. We also applied the same modeling framework to large-scale behavioral data from over 100,000 participants in the Implicit Association Task, revealing distinct lifespan trajectories of top-down inhibition. Together, these findings demonstrate how computational modeling can uncover latent cognitive mechanisms and shed some light on a mechanistic understanding of individual differences in cognitive inhibition.

Keywords: Cognitive inhibition, computational modelling, conflict tasks, evidence accumulation models.

Context and feedback shape the balance of learning and decision dynamics: An RL-DDM approach

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Human decision-making in uncertain environments depends not only on how individuals learn from experience but also on how contextual factors modulate this learning. The present project investigates how environmental valence (win vs. loss domain), feedback availability (full vs. partial), and regulatory focus (exploration vs. exploitation emphasis) jointly shape value learning and evidence accumulation. $N = 60$ participants completed an adapted two-stage decision-making task in which transitions between states follow a Markovian structure, while the above manipulations induce systematic shifts in motivational and informational context. We compared model-free and hybrid (model-free + model-based) learning algorithms embedded within a reinforcement learning-diffusion decision model framework that maps subjective value differences onto drift rate and overall value context onto decision thresholds. This approach allowed us to quantify how learning strategies translate into temporal decision dynamics. We further tested the condition effects of environmental valence, feedback availability, and regulatory focus on cognitive parameters. Hierarchical Bayesian model comparison results reveal the best fit for hybrid learning algorithms. Both environmental valence and regulatory focus interact with learning rates, with higher learning rates in the win domain and a promotion focus, and lower learning rates in the loss domain and a prevention focus. Feedback availability influences non-decision time and accuracy. The study offers a way to characterize how motivational and informational factors modulate the interplay between model-free and model-based learning and the dynamics of evidence accumulation. We discuss how the findings advance a mechanistic understanding of adaptive decision-making.

Keywords: diffusion decision model, reinforcement learning, cognitive modeling, Bayesian modeling, model-free learning, model-based learning

Exploring individual differences in cognitive parameter dynamics

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Variability can carry meaningful information beyond average values. In medicine, for example, heart rate variability provides insights that mean heart rate cannot. In cognitive psychology, however, individual differences in variability—particularly in parameters from cognitive process models such as the diffusion decision model (DDM)—have received relatively little attention. A major reason is that trial numbers feasible in individual differences research make DDM variability parameters difficult to estimate reliably. Recent advances at the intersection of Bayesian statistics and machine learning now make it possible to recover these parameters with greater precision. In this work, I draw on hierarchical Bayesian modeling to stabilize individual parameter estimates under low trial counts, and I employ a recently developed superstatistical framework to capture fine-grained, trial-by-trial fluctuations in cognitive processing. Across several existing datasets, I examine whether individual differences in the dynamics of DDM parameters—drift rates, non-decision times, and boundary separations—relate to individual differences in cognitive abilities. The superstatistical approach allows not only the estimation of within-person variability, but also explicit modeling of the temporal structure governing these fluctuations. A nuanced pattern of relationships emerges: variability and dynamic features of DDM parameters provide information that is not captured by mean parameters alone. These findings highlight the promise of using both hierarchical Bayesian estimation and superstatistical modeling to deepen our understanding of cognitive processes and their individual differences.

Keywords: diffusion decision model, variability, cognitive abilities, within-person dynamics, superstatistics, amortized Bayesian inference

Part I: Source Memory - Fundamental Questions

Tuesday, March 17, 09:00 - 10:30, HSZ - N5

Chair(s): Désirée Schönung¹, Nikoletta Symeonidou¹

¹University of Mannheim, Department of Psychology, Germany

Source memory research aims at understanding how people remember the origin of information (e.g., Where did I read the latest news?). This double symposium brings together findings from both basic (Part I) and more applied (Part II) source memory research. The first session highlights new developments in modeling approaches as well as empirical work addressing fundamental determinants of source memory. Beatrice G. Kuhlmann opens the session with “A Storage-Retrieval Extension of the Two-High-Threshold Multinomial Model of Source Monitoring.”, introducing an extended version of the often-used two-high-threshold multinomial model of source monitoring (2HTSM, Bayen et al., 1996). This extended version distinguishes between storage and retrieval components of source memory by incorporating two separate source-memory parameters. Meike Kroneisen follows with “The Rare and the Common: Can Rarity Influence the Animacy Effect in Source Memory?”, investigating whether the animacy advantage in source memory depends on the relative frequency of animate and inanimate stimuli. Her talk provides insights into how base-rate expectations and attention shape encoding and retrieval. In “Source Memory and Metamemory for Concrete and Abstract Words,” Désirée Schönung examines how people monitor their memory for different word types. The talk focuses on whether individuals distinguish between item and source memory in their metamemory judgments by recognizing that concreteness affects item but not source memory. Further advancing model-related aspects, Hilal Tanyas presents in her talk “Modeling Latency Processes in Source Monitoring” a formal modeling approach that integrates response times to the 2HTSM. This allows estimating the relative speed of memory- and guessing-based processes. Finally, Lena Nadarevic bridges to more applied questions of source memory in her talk “Source Effects in Memory for Truth and Falsity: A Comparison of Self-Generated Judgments and External Feedback”. Across two experiments, she investigates whether participants remember self-generated subjective truth judgments better than externally provided objective feedback, consistent with the generation effect. Together, these talks illustrate the range of current approaches to studying source memory, advancing theoretical and methodological understanding of source memory processes. The first session concludes with a general discussion, leading over to Part II: Source Memory - Applied Research.

Keywords: source memory, multinomial modeling, animacy effect, response times, truth judgments

A Storage-Retrieval Extension of the Two-High-Threshold Multinomial Model of Source Monitoring

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Source attributions, such as judging who told you something, involve item memory, source memory, and guessing processes. The two-high-threshold multinomial model of source monitoring (2HTSM; Bayen, Murnane, & Erdfelder, 1996) enables the separate measurement of these processes. However, its memory parameters do not separate storage and retrieval. In turn, lower source memory probabilities (2HTSM parameter d) may stem from failed source storage and/or failed source retrieval. Applying our novel test paradigm, where the standard source monitoring test is complemented by a source recognition test with reinstatement of source features from the study phase (Symeonidou & Kuhlmann, 2021), we propose a tailored extension of the 2HTSM to separately measure the probabilities of source storage (new parameter d_s) and source retrieval (new parameter d_r). In an experiment with $N = 108$ younger adults using words as items presented by two female speakers (source features: name + picture + voice) as sources, we show that this model fits empirical data well. Further crucial, targeted manipulations of storage (repetition at study) and retrieval (partial reinstatement of the speaker's name + picture but not voice in the first test) selectively influenced the source storage and retrieval parameter, respectively, validating their psychological interpretation. In addition, we will present an overview of applications of this model to the study of source forgetting and age-related deficits in source memory.

Keywords: source memory, episodic memory, multinomial processing tree modeling, cognitive modeling, storage, retrieval, forgetting

The Rare and the Common: Can Rarity Influence the Animacy Effect in Source Memory?

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¹RPTU Kaiserslautern-Landau, Germany

²University of Trier, Germany

³University of Mannheim, Germany

Evolutionary constraints have shaped not only our bodies but also our memory systems. In line with this, previous research has identified animacy as a key factor influencing memory performance. In a typical experiment, participants are presented with words denoting animate and inanimate objects. In a subsequent recall test, animate words are remembered better than inanimate ones. However, the proximate mechanisms underlying this effect remain unclear. In one experiment, we investigated the influence of the base rate of animate to inanimate objects on source memory. Previous studies have shown better source memory for animate compared to inanimate objects. The question arises as to how changes in base rates affect source memory for animate objects. Does attention generally shift towards minority objects even if these objects are inanimate, or does the source memory advantage for animate objects persist irrespective of majority-minority relations between animate and inanimate objects? We discuss the theoretical implications of our findings with respect to the mechanisms underlying the animacy effect.

Keywords: source memory, animacy effect, evolution

Source Memory and Metamemory for Concrete and Abstract Words

Désirée N. Schönung^{1*}, Giulia Albrecht¹, Beatrice G. Kuhlmann¹

¹University of Mannheim, Germany

Previous research has demonstrated that concrete words are remembered better than abstract words and that participants can anticipate this advantage in their judgments of learning (JOLs). The present study examined whether individuals can distinguish item from source memory (e.g., memory for the speaker of a word) in their metacognitive monitoring by also providing judgments of source (JOSs) for abstract and concrete words. We hypothesized that word concreteness would not affect source memory. Consequently, given that participants can distinguish their predictions for item and source memory, we hypothesized they use this item cue less—or not at all—when making JOSs. A total of 106 university students participated in a laboratory experiment in which they studied concrete and abstract nouns presented by either a male or a female speaker. After each item–source pair, participants provided both a JOL and a JOS. As expected, participants predicted and exhibited higher item memory for concrete compared with abstract nouns. However, contrary to our hypothesis, source memory also benefited from word concreteness. Consistent with this finding, participants incorporated concreteness into their JOSs, though to a lesser extent than in their JOLs. These results suggest that the item-cue concreteness is differentially weighed when making JOLs versus JOSs in line with the idea of metacognitive distinction between these two memory types. Given the unexpected effect of item concreteness on source memory, however, it remains unclear whether a cue selectively influencing item memory only would be fully discounted in JOSs.

Keywords: source memory, metamemory, judgments of source, multinomial modeling

Modeling Latency Processes in Source Monitoring

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²University of Mannheim, Germany

Source monitoring refers to attributing previous experiences (items) to their episodic context (source) (Johnson et al., 1993). Using the frequencies of correct and incorrect attributions in a source-monitoring test, the two-high-threshold multinomial processing tree (MPT) model of source monitoring (2HTSM; Bayen et al., 1996) provides separate probability estimates for memory (of item and source) and various guessing processes. Heck and Erdfelder (2016) further integrated response times (RTs) into MPT models and proposed a formal MPT-RT approach to estimate the relative speed of latent processes. The current study extends their modeling rationale to source monitoring and introduces the 2HTSM-RT model. To test whether the 2HTSM-RT fits empirical source-monitoring data, we designed a simple experiment with words as items and screen positions as sources. We collected accuracy and RTs of item and source test responses from 35 participants. Following the categorization of continuous RT data into discrete bins ranging from fast to slow responses for each participant based on their overall speed of responding, we computed the frequencies for all possible combinations of discrete attribution responses and RT bins. Initial model-related analyses indicated that the 2HTSM-RT jointly accounts for RT and accuracy data of a typical source-monitoring experiment. The RT-extended 2HTSM model provides more holistic information about the memory and guessing processes involved in source monitoring by estimating both the accuracy of the process outcomes (reflected in the standard 2HTSM model parameters) and the relative speed of these processes (reflected in the newly proposed latency parameters).

Keywords: source memory, multinomial modeling, response times

Source Effects in Memory for Truth and Falsity: A Comparison of Self-Generated Judgments and External Feedback

Lena Nadarevic^{1*}

¹Charlotte Fresenius Hochschule, Germany

Correcting misinformation is one of the key challenges of our time. However, debunking interventions show only limited success. Memory processes may contribute to this problem; for instance, people may be better at remembering their initial, subjective assessment of the veracity of information than they are at remembering externally provided, objective veracity feedback. Indeed, research on the generation effect suggests that self-generated information benefits from deeper processing and is therefore remembered particularly well. However, there is little research on whether this effect also applies to the generation of source or veracity information. To address this question, participants studied individual statements, some of which were presented together with “true” or “false” feedback in the feedback group, or judged as “true” or “false” in the judgment group. Data from a subsequent memory test were analyzed using a multinomial source memory model to disentangle memory for the statements, memory for the (judged) veracity of the statements, and different guessing processes. The analyses indicated a generation effect for both the statements and their (judged) veracity. Hence, as predicted, participants show better memory for their own veracity judgments than for external veracity feedback. Future research will investigate whether this also applies when self-generated judgments are combined with external feedback in a within-subject design.

Keywords: source memory, veracity, misinformation, generation effect, MPT model

Time to Think: Adaptive Mechanisms in Language Processing

Tuesday, March 17, 09:00 - 10:30, HSZ - 7E02

Chair(s): Susanne Dietrich¹

¹Evolutionary Cognition, Department of Psychology, University of Tübingen, Germany

Language comprehension often proceeds with remarkable speed, yet successful communication depends on the ability to slow down, revise, and adapt when input is ambiguous, unexpected, or inconsistent. This symposium brings together perspectives from neuroscience, psycholinguistics, and developmental research to examine how temporal flexibility supports coherent comprehension. “Time to think” is not a failure of processing but an adaptive resource: when comprehension is challenged, listeners and readers adjust the pace of processing to integrate conflicting cues, resolve ambiguity, and update mental representations. The symposium opens with a neurobiological perspective, showing how electrophysiological activity supports the processing of acoustic and abstract temporal structures in auditory-verbal stimuli. Studies from sentence comprehension and communicative interaction demonstrate that brain activity not only synchronizes with current stimuli but also aids the management of upcoming input through temporal estimation and prediction. These processes rely on structures such as the basal ganglia and pre-SMA, providing neural scaffolding for adaptive control. Neuroimaging evidence further shows that presupposition failures engage these circuits, indicating that discourse-related reinterpretation depends on adaptive gating and slowing mechanisms. The third talk presents psycholinguistic evidence on negation and pragmatic inference. Negation is rarely purely logical; comprehenders use it as a cue for pragmatic reasoning, revising mental models and integrating contextually relevant alternatives. Less felicitous contexts increase processing time, reflecting the additional effort required to construct a coherent interpretation. Next, a developmental perspective uses eye-tracking data from children learning German and Czech. Younger children struggle to integrate multiple linguistic cues for thematic role assignment, and their ability to reanalyse heuristics depends on language-specific features, such as word order versus case marking. Finally, ambiguity resolution in discourse is examined, showing how verb causality and adjective semantics shape pronoun interpretation. Comprehenders dynamically reweight cues integrating earlier expectations. Together, the contributions illustrate how slowing down, revising, and flexibly reallocating processing resources are central to achieving robust and coherent comprehension under uncertainty.

Keywords: Temporal processing, adaptive control, reanalysis, developmental cue integration, cue weighting

Neural time frames: How electrophysiological rhythms shape speech processing

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¹Max Planck Institute for Human Cognitive and Brain Sciences, Germany

During speech processing, the brain must handle incoming information streams across multiple time scales, from low rates (e.g., phrases, ~1 Hz), to higher rates (e.g., syllables, 4 Hz), and even very high rates such as phonemes (~30 Hz). The brain's electrophysiological activity may support the tracking of both acoustic and abstract information at these time scales by aligning its endogenous oscillations to the rate of incoming input. Such a mechanism could aid language processing by deriving predictions about the typical duration of linguistic units at each time scale. In this talk, I will present studies from our group that provide evidence for this theory across different time scales. At the level of phrases, acoustically cued prosodic phrase length supports the processing of upcoming sentences by sustaining oscillatory activity at the cued frequency even after the end of acoustic stimulation. Furthermore, studies from our lab suggest that rhythmicity at the syllable rate may facilitate coordination in communicative interaction by accelerating turn-taking. In these ways, the synchronization of neural oscillations may constitute an adaptive mechanism suited to efficiently process spoken language.

Keywords: language, neural oscillations, rhythm, speech tracking, prosody, conversation

The suitcase that didn't exist: fMRI evidence for adaptive mechanisms in presupposition processing

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Discourse understanding often requires retrieving or constructing context to establish coherent reference relations. Presuppositions (PSPs), linguistic expressions carrying background information, pose a challenge when their referential conditions are unfulfilled. Specifically, coherence may either not be established or be restored through accommodation (e.g., bridging). How the brain adaptively manages these demands under varying memory constraints remains largely unknown.

In an fMRI-behavioral experiment, we investigated two memory processes and PSP types: (a) memory-based contexts, where referential distance varied and triggered existence PSPs, and (b) inference-based contexts, where referents were not explicitly mentioned and contextual plausibility varied, targeting novelty PSPs. Participants judged the coherence of a test sentence relative to the preceding context. Coherence judgments in memory contexts showed that PSP violations were judged as less incoherent when referents appeared more distant, indicating higher working-memory load. In inference contexts, coherence judgments were mainly influenced by plausibility, with a small but significant PSP consistency effect.

For fMRI analysis BOLD responses were time-locked to the PSP trigger. In memory contexts, PSP consistency modulated the left IFG and right supramarginal gyrus (SmG), reflecting working-memory load and integration, while referential distance engaged executive regions such as pre-SMA and middle frontal gyrus. In inference contexts, plausibility violations recruited the salience network (bilateral insula, right SmG) and subcortical basal ganglia-thalamus loops, indicating adaptive allocation of attentional and interpretive resources.

These results highlight the involvement of the salience network in conflict detection and executive regions in maintaining discourse coherence, showing that PSP processing is dynamically shaped by memory constraints.

Keywords: salience network, executive control, discourse comprehension, accommodation

Not So Fast: Cognitive and Pragmatic Demands of Negation

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Negation is a central yet cognitively demanding feature of language that highlights the need for effortful slowing and reanalysis in comprehension. Understanding a sentence like “The door is not open” involves suspending a default affirmative interpretation and re-evaluating the state of affairs. According to the two-step model of negation processing, the initial stage involves activation of the affirmative meaning, followed by inhibitory control and reinterpretation. These inhibitory mechanisms appear to overlap with general cognitive control systems. The reinterpretation and selection of an appropriate alternative depend on pragmatic reasoning processes, which form the focus of the present work. Listeners infer why a speaker chose to use negation, considering communicative intent and discourse relevance. According to pragmatic principles, negation is most felicitous when it corrects a false presupposition or contrasts with an expected state of affairs, contexts in which comprehension has been shown to proceed more smoothly. Even without explicit context, listeners infer plausible alternatives rather than strict logical opposites, highlighting the pragmatic nature of negation. This study extends these pragmatic insights to large language models (LLMs). Like humans, LLMs often struggle with negated statements, appearing anchored to affirmative meanings, particularly when no salient pragmatic alternative is available. However, in offline cloze tasks, humans tend to complete negated sentences with particularly similar alternatives, reasoning pragmatically about what alternative state would make the negated statement relevant. Only conversationally trained chat models approximate human-like behaviour, indicating that effective negation processing might depend on pragmatic reasoning and discourse sensitivity acquired through dialogic experience.

Keywords: Negation, Pragmatics, Two-step Model, Inhibition, Alternatives, LLMs

When is it time to think about case marking? Evidence from learners of Czech and German in comparison

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In the linearly unfolding speech, different cues for agent/patient roles (word order, morphological markers) occur at different points and might be in conflict. In different languages, cues can have different weights based on their distribution or the language structure. Priority of the agent-first heuristic has been claimed, but its role in different languages has not been established clearly. Non-comparative studies indicated that children learning Czech comprehend morphological markers earlier than children learning German. We conducted a cross-linguistic study using pointing responses and eye-tracking to test 30 Czech-learning and 30 German-learning preschoolers. Children saw two pictures with reversed agent/patient roles (a mouse pulling a hedgehog and a hedgehog pulling a mouse). We used identical pictures and parallel picture descriptions for both languages. In four description conditions, each protagonist was presented either as agent (subject) or patient (object), once as the initial noun, once as the final noun. One noun had an unambiguous subject/object form contrast (der Igel/ježek ‘hedgehog.subject’ vs. den Igel/ježka ‘hedgehog.object’), the other had just one form (die Maus/myš ‘mouse’). Pointing data indicated that German-learning preschoolers interpreted the first noun as the agent across all conditions. Their Czech-learning peers discriminated word-order conditions well if the initial noun was unambiguous. Eye-movement data from the initially ambiguous condition revealed signs of an agent-first interpretation with incomplete reanalysis after the final-subject cue in Czech-learning preschoolers but no reanalysis in their German-learning peers. It seems that the input of Czech-learning children supports early acquisition of morphological cues and application of reanalyzing strategies.

Keywords: Czech, German, psycholinguistics, first language acquisition, morphology, word order, eye tracking

The Bear or the Lion - Who Did It? Adaptive Integration of Verbs and Adjectives in Pronoun Resolution

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Language comprehension relies on integrating lexical-semantic expectations and discourse-level cues, including contextual and causal information. Implicit Verb Causality (IVC) assigns default causal roles to discourse protagonists, fostering expectations about event interpretation. However, these verb-based expectations can be modulated by additional cues, such as adjective semantics. For example, in Winograd-style scenarios (“The trophy doesn’t fit in the brown suitcase because it is too small/large”), the adjective determines which referent maintains a coherent causal interpretation. This study examines how adjective semantics interacts with IVC to establish coherent causal relations. In two experiments, participants read short event descriptions followed by explanations containing an ambiguous pronoun and an evaluative adjective (e.g., “The bear annoyed the lion because it was aggressive.”). We manipulated whether the adjective-induced causality was congruent or incongruent with the IVC bias of the verb. Participants then judged the coherence of a target sentence by explicitly resolving the pronoun (e.g., “The lion was aggressive.”).

Coherence judgments reflected an interaction between verb- and adjective-based biases: coherence was highest when both aligned and decreased when they conflicted. Adjective-driven expectations were weighted more strongly than verb-based biases, which still influenced interpretation. This differential weighting shows that readers combine multiple sources of information in a flexible, cue-weighted manner, demonstrating adaptive integration in pronoun resolution to maintain coherence under ambiguity.

Keywords: Implicit Verb Causality, discourse comprehension, referential ambiguity, causal inference

Part I: TVA: Individual, Computational, and Interactive Perspectives

Tuesday, March 17, 09:00 - 10:30, C-Building - N14

Chair(s): Kathrin Finke¹, Ingrid Scharlau², Jan Tünnermann³

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³Charlotte Fresenius University of Psychology, Cologne, Germany

The Theory of Visual Attention (TVA) continues to be developed as a powerful quantitative framework for understanding attentional selection and capacity. Current research applies TVA across diverse contexts and methodologies. This symposium presents new theoretical developments, methodological advances, and applied perspectives that extend TVA's reach and precision and sometimes challenge its present state. Estela Carmona investigates how self-relevant information shapes attentional parameters, offering insights into the role of personal significance in visual selection. Anders Petersen follows by introducing advances in modeling enumeration data within the TVA framework, extending the set of tasks that can be used with TVA. Kai Biermeier, Ngoc Chi Binh, and Ingrid Scharlau test the applicability of TVA to online scenarios and identify methodological challenges in the online estimation of attentional processing speed. Tobias Peters, Kai Biermeier, and Ingrid Scharlau apply TVA measures of attention to human-AI interaction, examining whether attentional signatures can indicate adaptive distrust. Finally, Jan Tünnermann and Ingrid Scharlau revisit lateral asymmetries in visual processing, presenting updated findings on left-right visual field differences within TVA. Together, these contributions demonstrate the continuing vitality of TVA research and its capacity to inform theoretical, methodological, and applied perspectives on visual attention but also challenges that have to be addressed. Part II of the symposium will turn to attentional changes in diverse populations.

Keywords: Attention, computational modelling, theory of visual attention, visual short-term memory, top-down control, working memory, processing speed

The effect of self-relevant information on TVA attentional parameters

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Background: It has been suggested that self-relevant information modulates attention (Humphreys & Sui, 2016). However, whether this effect occurs and what mechanisms drive it remain debated. The framework offered by the Theory of Visual Attention (TVA; Bundesen, 1990) is well-suited to address this question, as it provides a computational and mechanistic account of attentional selection in vision, and TVA-based testing allows for the estimation of several core attentional parameters. A recent account combining the temporal order judgement paradigm and TVA-informed Bayesian modelling (Scheller et al., 2024) suggested that social relevance modulates early attentional selection by increasing processing rates and influencing how attentional resources are allocated across the visual field. However, more evidence is needed. Therefore, the present study investigates whether self-relevant information modulates attentional selection with a more classical TVA-based paradigm.

Methods: Healthy participants first complete a task designed to establish individual associations between neutral stimuli and themselves or a stranger. They then perform a classical TVA-based paradigm, allowing all attentional parameters to be estimated separately for self- and other-associated information.

Preliminary Status and Expected Outcomes: Data collection is ongoing, and modelling and analyses will be completed before the symposium. Analyses will test which, if any, attentional parameters are modulated by self-relevance.

Significance: This study aims to provide further evidence on whether and how self-relevant information modulates attentional processes, contributing to a better understanding of the mechanisms underlying self-related processing.

Keywords: Self-prioritization effect; self-relevance; perceptual processing; attention; visual selection; theory of visual attention; social cognition

A TVA-based model of the enumeration task

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The ability to accurately enumerate visual items provides a window into the mechanisms and limits of visual attention. In this study, I model performance in a dot enumeration task using the Theory of Visual Attention (TVA). Participants reported the number of dots briefly presented on a screen, with exposure duration systematically manipulated and precisely controlled by backward masking. Accuracy was near perfect for displays containing one to four dots but declined progressively as the number of dots increased, reflecting the transition from subitizing to counting. The model captured individual differences in attentional efficiency by explicitly accounting for both correct and incorrect responses across exposure durations, providing a very detailed characterization of performance. In addition, the model incorporated grouping processes, revealing how the perceptual organization of dots shapes enumeration accuracy. This approach demonstrates how TVA can be modified to capture not only capacity limits in visual attention, but also the emergent structure of perceptual grouping during enumeration.

Keywords: mathematical modeling, enumeration task, attention

Challenges in the online estimation of attentional processing speed

Kai Biermeier^{1*}, Ngoc Chi Binh¹, Ingrid Scharlau¹

¹Paderborn University, Germany

Visual attention is one of the oldest topics in psychological research, yet its mechanisms remain only partly understood. Especially the temporal progression remains a challenging topic. This is largely due to the short-livedness of attention shifts, which makes it hard to gather enough data points in a given time.

Eye-tracking is a very quick and well-established method to assess overt attention. Nevertheless, it is not capable of measuring covert visual attention. Further, there is no comparable method to capture covert visual attention and, more specifically, total processing speed over time. This is not surprising because the measurement of total processing speed requires not only additional data per time unit but also fast inference methods, as it cannot be directly observed but only inferred. In this talk, we introduce a framework grounded in Bundesen's Theory of Visual Attention (TVA) that enables the temporal analysis of covert attention. We evaluated this framework through simulation studies. First, the strengths and limitations of various estimation methods in this context are outlined. Further, the feasibility of quick and frequent estimation under specific assumptions — namely, limited deviation of processing speed from the previous to the next time point, reduced processing speed due to a secondary task, and a sufficiently well-estimated initial processing speed is demonstrated. Finally, we outline an experiment for future empirical evaluation of online estimation based on our proposed framework.

Keywords: covert visual attention, processing speed, online estimation, computational modelling, theory of visual attention

Interpreting changes in visual attention: can it indicate healthy distrust in human-AI interaction?

Tobias Peters^{1*}, Kai Biermeier¹, Ingrid Scharlau¹

¹Paderborn University, Germany

The Theory of Visual Attention (TVA) is a well-established approach to quantify visual attention by theoretical meaningful parameters. Beyond fundamental research e.g., on saliency, TVA has been successfully applied to diverse contexts, including clinical populations, virtual reality, or traffic situations. In this talk, we present an experimental approach that takes the application of TVA even further. Motivated by recent developments in artificial intelligence (AI), we use TVA to assess visual attention during mock-up human-AI interaction. We hypothesized that visual attention could serve as an indicator of healthy distrust towards AI. Healthy distrust describes a reasonable, careful stance towards AI with the aim of mitigating overreliance. Crucially, this stance and the related notion of appropriate trust are informed not only by actual AI errors, but also by a mere intuition that errors are possible. The typical measurements of these notions – self-reported (dis)trust and reliance – only indirectly measure whether participants notice (potential) errors. We propose that visual attention complements self-report and behavioral measures by other cognitive aspects, such as vigilance.

We compared participants' attentional capacity and attentional weight towards correct and incorrect mock-up AI classifications. While we observed that misclassifications reduced attentional capacity, this capacity reduction was not beneficial for subsequent judgments of the classifications. Furthermore, the attentional weighting was not affected by the classifications' correctness. It was only affected by the difficulty of categorizing the stimuli themselves. Thus, we will discuss the advantages and disadvantages of using visual attention as an indicator of appropriate trust and healthy distrust.

Keywords: Healthy distrust, appropriate trust, visual attention, Theory of Visual Attention, human-AI interaction, Bayesian cognitive model, image classification

A TVA-Based Investigation of Hemifield Differences Across Varying Stimulus Configurations

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²Paderborn University, Germany

Earlier findings from our Temporal-Order Judgment (TOJ) studies showed a mixed pattern of hemifield effects, hinting that Left Visual Field (LVF) advantages may diminish when attention is narrowly focused. To examine this more directly, we introduced a new stimulus arrangement in which one item always appeared at the currently fixated location while the probe was shown peripherally at multiple positions. Using TVA modeling, we analyzed this new configuration and contrasted it with our earlier series of experiments involving two peripheral stimuli. In conditions of more focused attention, we found no evidence for LVF advantages. We speculate that LVF benefits arise under default or uncertain attentional states but disappear when attention is strongly bound to a known location. These findings clarify how attentional focus and stimulus arrangement combine to shape temporal-order judgments and demonstrate the value of TVA for investigating hemifield asymmetries.

Keywords: Selective Attention, Prior Entry, Theory of Visual Attention, TVA

Switching It Up: How Task- and Reward-Regularities Shape Cognitive Flexibility

Tuesday, March 17, 11:00 - 12:30, HSZ - N1

Chair(s): Linda Carmen Bräutigam¹, Irina Monno², Amy Strivens³

¹University of Tübingen, Germany

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A key challenge in cognitive control research is understanding how humans flexibly adjust their behaviour in response to changing environmental and motivational demands. This symposium centres on the concept of cognitive flexibility, commonly defined as the ability to shift between distinct thoughts, strategies, or perspectives in response to situational requirements. We aim to bring together complementary perspectives examining how contextual regularities, affective and motivational factors shape the dynamic balance between cognitive flexibility and stability. By combining manipulations of switch probability, conflict adaptation, and reward, the symposium highlights how experience and expectations guide adaptive control allocation across different domains. Amy Strivens (University of Tübingen) investigates interactions between global and local control by combining switch-probability manipulations with the congruency sequence effect (CSE), offering new insights into how control operates across multiple temporal scales. Linda Carmen Bräutigam (University of Tübingen) explores the interaction between context-specific proportion congruency (CSPC) and switch probability across three conflict paradigms (Simon, Stroop, and Flanker), revealing how adaptive control mechanisms generalize across tasks while remaining sensitive to contextual predictability. Luca Moretti (University of Milano-Bicocca) presents evidence for a flexibility-stability trade-off when using valency rather than congruency as a measure of cognitive stability, thereby broadening theoretical accounts of how control adjustments manifest across cognitive dimensions. Larissa Walter (University of Freiburg) examines the impact of contingent versus non-contingent reward on switch rate and switch costs in the self-organized task switching paradigm, highlighting how different reward types modulate task performance and task selection behaviour. Finally, Jonathan Mendl (University of Regensburg) investigates how reward expectation shapes adjustments of flexibility, showing that rare high rewards heighten the sensitivity to increasing and remaining high reward. Overall, the symposium seeks to advance our understanding of cognitive flexibility as a key mechanism of adaptive behaviour. Considering evidence across different paradigms and approaches, the symposium highlights how control dynamics emerge from the interaction of contextual expectations, task demands, affective and motivational states—offering a more comprehensive understanding of how flexible behaviour is achieved.

Keywords: Cognitive control, Cognitive flexibility, Switch probability, Context-specific proportion congruency (CSPC), Reward manipulation, Flexibility-stability trade-off, Adaptive behaviour

Does Global Context Shape Local Conflict Adaptation? Evidence Across Timescales.

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A central question in cognitive control research is how humans flexibly adjust control in response to changing contextual demands. Such adjustments of control parameters occur across multiple timescales: from the trial-by-trial changes reflected in the congruency sequence effect (CSE) to broader, block-level shifts driven by task composition or switch probability. While local adjustments such as the CSE are well documented, it remains unclear whether global control settings modulate these local processes. This talk explores that question by examining how global context influences local conflict adaptation. Across three task-switching experiments using Flanker tasks, we manipulated the global control settings - via switch probability and use of single and mixed task blocks – to examine their potential influence on the CSE. Experiment 1 varied switch probability to test whether increased control due to frequent task switching leads to a greater CSE effect. Experiment 2 compared single- and mixed-task blocks to replicate and extend prior findings on block-level influences. Experiment 3 combined both manipulations to allow for direct comparison and to assess possible interactions between these two global adjustments. While prior work reported block-level effects on the CSE, this talk will assess whether we could replicate and extend this influence of global manipulations on local adaptation. The present experiments aim to inform models of cognitive control and clarify how cognitive flexibility is organized across different timescales.

Keywords: cognitive control, flexibility, congruency sequence effect, switch probability

When Contexts change: How Context Switch Probabilities Shape CSPC Effects and Switch Costs are Shaped by Context and Congruency

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Cognitive control enables individuals to flexibly regulate behavior in response to changing environmental demands. A key aspect of this flexibility is the ability to switch between contexts while still being able to adapt control to context-specific demands. Such adaptability is evident in conflict tasks through the context-specific proportion congruent (CSPC) effect, which demonstrates how attention is allocated based on contextual regularities. In the present experiments, we paired a proportion congruency (PC) manipulation with location-based contexts to elicit context-specific control and manipulated context switch probabilities (high vs. low) to vary environmental stability. In three experiments, we employed Stroop, Flanker, and Simon tasks to examine shared and task-specific control dynamics, including whether different conflict tasks engage distinct control mechanisms. Across all tasks, CSPC effects were modulated by switch probability, with stronger effects when contexts repeated frequently. This demonstrates that contextual control depends not only on congruency structure but also on environmental stability. Furthermore, we examined switch costs related to both context and congruency. Performance improved when both features repeated and declined when either switched, indicating an interaction between context and congruency transitions. This pattern prompts the question of whether these effects reflect an extended congruency sequence effect (CSE) that includes contextual information or whether additional context-specific control policies are at play. Together, this talk will highlight how contextual structure and switching demands jointly shape adaptive control and emphasize the importance of contextual stability for forming reliable control policies across different conflict tasks.

Keywords: Cognitive Control, Switch Probability, Switch Costs, Context-Dependent Proportion Congruency (CSPC) Effects, Conflict Tasks

Do cognitive stability and flexibility trade off? It depends on how you ask

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It is almost intuitive that, at any given moment, we shield ongoing activities from distraction (i.e., we maintain stability), while remaining ready to switch to a new task if needed (i.e., we maintain flexibility). What is currently unclear, is whether the abilities to be flexible or stable are regulated independently, or one impacts the other. According to control-dilemmas accounts, cognitive flexibility and stability reflect antagonistic processing modes that must be optimally balanced depending on the circumstances. Under this view, greater flexibility entails less stability, and vice-versa. However, recent task-switching studies challenge this notion, showing that manipulations enhancing cognitive flexibility (e.g., increasing the proportion of switch trials) do not impact stability (as indexed by the congruency effect), and, complementarily, manipulations enhancing cognitive stability (e.g., increasing the proportion of incongruent trials) do not impact flexibility (measured with the switch cost). Although these findings have been replicated, it is unknown whether they generalize to other measures of stability and flexibility. We investigated this question by employing an alternative operationalization of stability, the valency effect (the difference between bivalent-congruent and univalent trials). Across three experiments and a re-analysis of published datasets, we manipulated the proportion of switch trials (promoting/discouraging flexibility) and the proportion of bivalent trials (promoting/discouraging stability). We observed that both manipulations held opposite effects on the switch cost and the valency effect. These results align with the trade-off view and highlight the need for a broader range of stability and flexibility measures to characterize the interplay between task shielding and task switching.

Keywords: Task switching, cognitive control, metacontrol, cognitive stability, cognitive flexibility, task conflict

Adapting to the flexibility-stability trade-off through experience, not instructions

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Cognitive flexibility is essential in daily multitasking, but is constrained by a trade-off with cognitive stability. Although dual-task performance can follow serial or parallel strategies, it is unclear whether people can voluntarily regulate these strategies through explicit instructions. In four between-subject experiments ($N = 650$), we asked participants to adopt a parallel (flexible) or serial (stable) strategy. However, instructions had no effects on task-switch costs or task-rule congruency effects, suggesting people were unable to alter strategy use. In contrast, manipulating proportion congruency had a direct effect on conflict processing alone, indicating that targeted strategic adaptations are possible. Notably, we observed a flexibility-stability trade-off in the first block, reflected in a negative correlation between switch costs and congruency effects, which, interestingly, gradually dissipates by the fourth block. This reversal replicated across four additional, independent datasets (total $N = 1764$). Together, these results suggest that while the flexibility-stability trade-off may be inherent, people can adapt to it through learning and practice, but not through explicit instructions.

Are We More Flexible Under Non-Contingent Reward? The Impact of Different Reward Types on Cognitive Flexibility

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Previous studies have shown that reward can modulate the dynamic balance between cognitive flexibility and stability. Earlier research on how changing reward magnitude impacts behavior in task switching paradigms has demonstrated, that increasing reward between two trials leads to decreased switch costs and increased switch rates compared to remaining high reward. This suggests that increasing reward leads to more flexible behavior. While most studies focus on contingent reward, in the present study we focused on the potential impact of different types of reward on task choice and task performance using the self-organized task switching paradigm.

Building on earlier findings and the theoretical framework proposed by Notebaert and Braem (2015), we hypothesized that non-contingent reward would promote cognitive flexibility—reflected in higher switch rates and lower switch costs—compared to contingent reward. Across two experiments, we compared a contingent reward, a non-contingent reward, and a no-reward condition using a within-subjects design. In Experiment 1 ($n = 96$), only contingent reward showed smaller switch rates and larger switch costs compared to the no-reward condition. Non-contingent reward did not differ significantly from no-reward or contingent reward. Although Experiment 2 ($n = 64$) aimed to strengthen the manipulation of type of reward by additionally presenting scenario texts introducing a contingent vs. a non-contingent situation, the expected effects were not replicated.

Overall, the results suggest that contingent reward may reduce cognitive flexibility in task switching, whereas no evidence was found for an effect of non-contingent reward on cognitive flexibility.

Keywords: non-contingent reward, task-switching, scenario-based, task selection, task performance, cognitive flexibility

Language Models as Tools for Psycholinguistics

Tuesday, March 17, 11:00 - 12:30, HSZ - N2

Chair(s): Cosimo Iaia¹, Jack E Taylor²

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The development of powerful computational language models in recent years has seen an increasing application of such models in psychology and psycholinguistics. Both Distributional Semantic Models (e.g., word2vec, GloVe, etc) and Large Language Models (e.g., GPT, BERT) have been applied in two main ways: (1) as models of human language processing, and (2) as tools for generating measures that are relevant to psycholinguistic theories and hypotheses. However, the distinction between these two applications of language models is not always clear, and both applications are limited by fundamental differences in language processing between models engineered to achieve human-like performance, and the processes actually used in human language. Nevertheless, language models have demonstrated strong potential for providing insight into language processes. This symposium brings together five talks to address recent developments in the use of language models as tools for psycholinguistics, and the degree to which such models provide comparisons and outputs that are meaningful for progress in the field. The first talk will set a theoretical foundation for the symposium, evaluating caveats of comparing Large Language Models to humans, and outlining how meaningful comparisons require rigorous experimental methods. The second talk explores whether humans and language models (both Large Language Models and Distributional Semantic Models) represent abstract meaning in a similar way, while also highlighting differences emerging between the two systems. The third talk shows how Large Language Models can be used to generate new iconicity ratings for Turkish, providing a new avenue for investigating semantic dimensions in otherwise understudied languages. The fourth talk evaluates how well estimates of word frequency and familiarity derived from Large Language Models can explain children's reading times. Finally, in the last talk, Distributional Semantic Models are applied to provide insight into the learning of morphology, showing that natural text provides sufficient information to learn the meanings of prefixes and suffixes. Together, these talks highlight the ongoing potential of language models as tools for psycholinguistics. However, these talks also provide opportunity for important discussion on the caveats of this approach, and on the scientific applications language models can support.

Keywords: LLMs, psycholinguistics, semantics, alignment

Of apples and oranges: Comparing LLM to human performance requires experimental rigor

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The rapid advancement of Large Language Models (LLMs) has sparked substantial interest in comparing their performance with that of humans. However, determining what constitutes a fair and meaningful comparison between their performance and the underlying capacities remains an open question – especially different comparison methods lead to substantially different conclusions.

As a starting point, we systematically elicited grammaticality judgments from three LLMs via prompting, and found low linguistic accuracy, instable response patterns across repeated prompts, and a pervasive yes-response bias – all differing substantially from human responses for the very same tasks. In a response, Hu et al. (2024) argued that prompting only elicits meta-linguistic judgments, and does not assess the true underlying capacities of LLMs. Comparing the probabilities LLMs assign to minimal pairs of grammatical versus ungrammatical sentences, they found lower probabilities for the ungrammatical sentences in almost all cases. However, this fundamentally changes the comparison: comparative grammaticality judgments on pairs of sentences are a fundamentally different task than absolute grammaticality judgments on individual sentences. Additionally, we can show that higher probabilities in minimal-pair comparisons are not specific to grammaticality judgments, but are also found for pragmatically semantically sound versus odd sentences. Therefore, such minimal-pair comparisons are also not diagnostic for grammatical violations.

Together, these studies illustrate that empirical comparisons between humans and LLMs require a rigorous experimental design – aligning independent variables, dependent variables, and testing conditions.

Keywords: Large Language Models, LLMs, psycholinguistics, methodology

The Representational Alignment between Humans and Language Models is Implicitly Driven by a Concreteness Effect

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Words in human language can be conceptualized as more abstract (like justice) or more concrete (like table). Cognitive psychology has established that this property of word meaning influences how words are processed. Thus, understanding how concreteness is represented in our mind and brain is a central question in psychology, neuroscience, and computational linguistics. While the advent of powerful language models has allowed for quantitative inquiries into the nature of semantic representations, it remains largely underexplored how they represent concreteness. Here, we leveraged an odd-one-out task to estimate semantic distances implicitly used by humans, for a set of carefully selected abstract and concrete nouns. Using Representational Similarity Analysis, we find that this implicit representational space based on human ratings from 40 participants and the semantic representations of five frequently-used language models (fastText, word2vec, BERT base, BERT large, and GPT2) are significantly aligned, and that both representational spaces are aligned to an explicit representation of concreteness (based on concreteness ratings provided by the same participants). Most importantly, using model ablation experiments, we demonstrate that human-to-model alignment is substantially driven by concreteness, but not by other word characteristics like word length or frequency. Overall, human-to-model alignment is sensitive more to semantic than to non-semantic variables. Combined, these results highlight a critical role for concreteness as a mediator of the alignment between human word representations and language models. More generally, this work shows that language models can be useful tools for understanding the nature of semantic representations in the human mind and brain.

Keywords: language models, alignment, semantic representations, concreteness

Bridging Minds and Models in an Understudied Language: Iconicity Rating Correlations in Turkish

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Iconicity refers to a resemblance between orthographic word form and meaning, facilitating word learning and recognition. Psycholinguistic science has long been shaped by Eurocentric biases (Share, 2021), with most large-scale evidence for iconicity originating from English and other Indo-European languages (Perry et al., 2015; Blasi et al., 2022). We address this gap by examining correlates of iconicity in Turkish, a morphologically rich and underrepresented non-Indo-European language. Additionally, we compare whether large language models capture similar patterns to human intuitions. Native Turkish speakers (target $N \approx 240$) rate 900 words for their iconicity. We test whether iconicity varies across lexical categories (e.g., adjectives > nouns), as has been shown in English and Spanish, and how it relates to other semantic factors, including age of acquisition, imageability ratings, orthographic neighborhood structure (OLD20), semantic neighborhood density, and orthography–semantics consistency. After collecting human ratings, we generate parallel estimates from Gemma 3 27B Instruct and GPT-4-o-mini (API) large language models (LLM) and assess human–LLM correspondence via Pearson correlations and mixed-effects models. We predict that words with orthographic neighbors that are also semantically similar will receive higher iconicity ratings and that iconicity will correlate positively with imageability and negatively with age of acquisition. With LLM data, we assess correlations with human behavioral data and similarities in the correlation patterns between the different semantic variables. By integrating behavioral and model-based data, the study contributes both conceptually, expanding iconicity research beyond Indo-European languages, and methodologically, by testing how symbolic and statistical systems converge in representing sound–meaning resemblance.

Keywords: iconicity, age of acquisition, imageability, orthography–semantics consistency, large language model (LLM), computational psycholinguistics

Assessing the Validity of LLM-Derived Psycholinguistic Measures: the Case of Word Familiarity

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Recent research suggests that LLM-generated word familiarity ratings outperform traditional frequency measures in predicting adult lexical decision times (Brysbaert et al., 2024). Here, we report a validation study that assesses whether these ratings indeed reflect lexical knowledge learned by the model, or if they partially result from memorization of existing human rating datasets present in the LLM's training data. This distinction has important implications for the validity of LLM-derived psycholinguistic measures.

We address this training-data leakage concern by using open-source language models with publicly documented training data. In a first step, we select two LLMs and determine whether their training data excludes existing word familiarity ratings. Second, we derive familiarity estimates using appropriate prompting.

We evaluate these LLM-derived measures against German children's word reading times from the Devel corpus, comparing them to traditional corpus frequencies from DWDS and childLex. Using pre-registered analyses, we test whether LLM-based familiarity and frequency measures explain variance in reading times beyond standard controls (word length, orthographic features).

This study provides an empirical validation of LLM-derived lexical measures while addressing concerns about training-data contamination. Our findings inform best practices for using language models as tools in psycholinguistic research and clarify the conditions under which LLM-generated measures can be used for obtaining lexical variables.

Brysbaert, M., Martínez, G., & Reviriego, P. (2024). Moving beyond word frequency based on tally counting: AI-generated familiarity estimates of words and phrases are an interesting additional index of language knowledge. *Behavior Research Methods*, 57(1), 28.

Keywords: LLM, word familiarity, word frequency, children's reading, training-data leakage, psycholinguistic validation, German lexicon

Modelling affix learning from reading: Insights from compositional distributional semantics

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Most words in English and other languages are built by combining smaller units of meaning called morphemes (e.g., teach + -er → teacher). Understanding a language's morphology is essential for developing reading expertise because it enables readers to compute the meanings of familiar and unfamiliar words (e.g., tweeter). Our work investigated what English-speaking children can learn about English morphology through text experience. We trained a compositional distributional semantic model on words from 1,200 books popular with British children aged 7–16 to investigate what the model can learn about affix meanings through reading. We then assessed whether the model's knowledge of affix meanings aligned with that of 120 adults in a lexical decision task. The model's knowledge of individual affixes accounted for patterns in readers' lexical processing: affixes estimated by the model to have richer, more coherent meanings were better known, and this was associated with both the number of distinct words containing each affix and the level of noise in their usage. Our work shows that, despite high levels of noise, natural text contains enough structure to support the extraction of core affix semantics, and that readers' knowledge of affixes reflects the patterns found in text. This study adds a new dimension to a more principled and psychologically grounded understanding of morpheme learning.

Keywords: Reading, morphology, compositional distributional semantics, semantic space, affix, children's books

Toward a Unified View of Categorization: Linking Cognitive Mechanisms and Social Consequences

Tuesday, March 17, 11:00 - 12:30, HSZ - N3

Chair(s): Rebecca Albrecht¹, Florian Seitz²

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Categorization processes are fundamental to how humans structure, interpret, and interact with the world. They shape individual perception as well as higher-level judgments and decisions, and at the societal level play a key role in stereotyping, prejudice, and group formation. Yet, research on perceptual and social categorization has largely proceeded along separate tracks. Whereas perceptual research has aimed to identify domain-general mechanisms underlying individual categorization, social research has aimed to uncover the broader implications of categorization for group dynamics. Integrative approaches that bridge perceptual and social categorization remain rare.

Differences in research goals are mirrored by differences in methodology. Perceptual research typically relies on simplified, abstract tasks that maximize internal validity and support formal modeling, often at the expense of external validity. Social research, in turn, embeds categorization in realistic contexts that reflect lived experience and intergroup relations, but at the cost of making it harder to isolate and formalize the underlying processes. Recent methodological advances—from richer behavioral paradigms to automated theory discovery using ML/AI—create novel opportunities to combine the strengths of both traditions. These developments make it increasingly possible to study categorization in contexts that are both controlled and ecologically valid, paving the way for genuine integration of perceptual and social research.

This symposium is structured around three complementary steps in building this bridge. The first examines computational models of categorization and asks what predictions they offer for understanding social categorization. The second starts from the opposite direction, considering how phenomena of social categorization and judgment can be explained within computational frameworks. The third takes a meta-perspective, highlighting how recent methodological advances—ranging from large-scale experimentation to theory-driven simulations and formal model comparison—create new opportunities for linking the two traditions. Together, these perspectives show how research on categorization can move beyond separate traditions by uniting mechanistic explanations with social consequences and aligning methodological control with ecological relevance, paving the way toward a unified theory of categorization.

Keywords: Categorization, Social Cognition, Cognitive Modeling, Similarity-Based Learning, Valence and Evaluation, Prevalence-Induced Concept Change (PICC), Adaptive Cognition

How Social Identity Shapes Concept Expansion

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How people draw category boundaries shapes not only perception but also social judgment, influencing who is included or excluded from a group. Prevalence-induced concept change captures this adaptive process: when one category becomes rarer, people broaden it to include previously excluded items. In perceptual domains, this adaptation is typically symmetric—boundaries shift in either direction depending on which category becomes rare. In social categorization, however, categories carry evaluative meaning, and these meanings may constrain or bias category expansion.

The present study examines whether adaptive boundary shifts depend on group membership. In two experimental sessions (at least two weeks apart), participants begin the first session by self-selecting into one of two abstract social groups representing two ends of a one-dimensional attribute. In each session, group identity is then reinforced through a three-way public-goods game. Subsequently, participants complete a binary categorization task in which stimuli vary gradually between the two social-group prototypes. After completing a first block of uniformly distributed stimuli, category prevalence is manipulated within participants across the two experimental sessions: either the in-group or the out-group becomes rare (order counter-balanced across participants).

If categorization shifts are governed purely by the stimuli, boundary shifts should occur symmetrically. In contrast, we hypothesize that people resist expanding their in-group concept while being readily willing to expand the concept of the out-group. Examining such asymmetries will help clarify how the evaluative meaning of social categories interacts with domain-general adaptation processes and may inform a process-level account of how flexible categorization mechanisms shape social categorization.

Keywords: Categorization, Social identity, Prevalence-induced concept change, Adaptive cognition, In-group bias

The Evaluative Consequences of Social Categorization

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Categorization is one of the most basic principles of human perception. It relies on the shared differences between exemplars from different categories. In the social domain, this translates into an emphasis on the differences between members of different social groups. Categorization thereby affords differentiation. In this talk, I will summarize experimental research on the formation of attitudes and stereotypes, as well as real-world analyses of stereotype content, which demonstrate the evaluative consequences of categorization-induced differentiation. Because differentiating attributes or behaviors are typically negative, differentiation and, by proxy, categorization often lead to a negatively biased view of the social environment, including the formation of negative stereotypes and prejudices, intergroup biases, and a more negative perception of society as it diversifies.

Keywords: social perception, cognition, categorization, stereotypes, diversity

Using conceptual scaling to map how individuals understand abstract concepts

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How can we quantify how people understand abstract, socially relevant concepts such as "truth", "health", or "gender"? How do individuals differ in their understanding of these concepts? In this talk, I present recent work using Conceptual Scaling to address these questions. We draw on perceptual categorization research and ask participants to judge concept similarity using triplet comparisons. From these judgments, we construct individual conceptual maps that embed a target concept, such as "truth," among theoretically motivated neighbors like "reality," "honesty," or "reason." The relative position of the target concept reveals how an individual understands that concept. It allows us to investigate which theoretical position a participant aligns with and how pluralistic their conceptual understanding is. For example, it captures whether someone thinks of "health" as the absence of disease, as a lifestyle-related concept, or as a blend of both. Combining conceptual maps with demographics, we can examine whether conceptual understanding varies systematically with participant characteristics—for instance, how political orientation relates to seeing "gender" as a biological or a social concept. Moreover, we show that relations within individual maps predict how people apply the concept in vignette judgments months later, demonstrating predictive and temporal stability.

Taken together, conceptual scaling provides a principled way to investigate abstract concepts at the individual level, moving beyond vignette tasks, survey methods, and corpus-derived approaches. By illuminating inter-individual differences in conceptual understanding, we hope that our approach ultimately contribute to clearer communication and a better grasp of the sources of disagreement in public and philosophical discourse.

Keywords: Concepts, Categories, Conceptual Scaling, Embedding, Similarity Judgments, Psychological Space, Triplet Comparisons

A Unified Similarity Framework for Modeling Category Variability and Feature Correlations

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¹University of Basel, Switzerland

Understanding how people use variability and correlations among features is essential for understanding social cognition. Social groups often differ in their variability (e.g., more diverse appearance among artists than bankers), and many features are correlated (e.g., colorfulness of clothing correlating with hairstyle distinctiveness). Such distributional information can shape social categorization and may contribute to stereotyping—for example, when group variability is underestimated or feature correlations are overweighted. This project presents a unified similarity-categorization model that models how feature variances and correlations jointly shape psychological similarity and category inference. Specifically, we use an exemplar framework to compare two ways of similarity computation, representing categorization processes that ignore or incorporate distributional information, respectively. Two experiments manipulated feature variances or correlations across categories to test whether people rely on distributional information when categorizing transfer stimuli. In the variance experiment, transfer stimuli were positioned between a high-variability and a low-variability category. In the correlation experiment, transfer stimuli aligned with the correlation structure of one category but differed less from the other category. Across both experiments ($N_s = 43$), people generally ignored distributional information, suggesting reliance on cognitively simple categorization strategies. Importantly, the materials used offered participants no strong prior beliefs about category variability or feature correlations, and processing distributional information was not required for category learning. We discuss how the modeling framework can be extended to real-world social categorization tasks—where people may have stronger prior distributional beliefs—providing a principled approach to study how distributional information shapes social judgments in ecologically meaningful contexts.

Keywords: variability, correlation, categorization, similarity, cognitive modeling

Part II: Applying Diffusion Decision Models Across Domains: Individual Differences and Cognitive Mechanisms

Tuesday, March 17, 11:00 - 12:30, HSZ - N4

Chair(s): Nicola Schneider¹

¹Heidelberg University, Germany

The diffusion decision model (DDM) is a mathematical framework that jointly describes choice behavior and response time distributions, offering a process-level account of how people make decisions. Conceptualizing decisions as the accumulation of noisy evidence, the DDM has provided insights into the cognitive mechanisms underlying perception, attention, memory, and higher-order decision-making. Its flexibility and explanatory power have made it one of the most widely used tools in experimental psychology, bridging cognitive theory, mathematical modeling, and empirical research.

The explanatory power and versatility of the DDM have made it indispensable for testing psychological theories. By illustrating how the model bridges the gap between quantitative modeling and psychological theory, we aim to highlight the value of DDMs for understanding individual and group differences, clinical dysfunctions, and social-cognitive processes. Together, these studies illustrate the breadth of DDM applications across experimental psychology and highlight how cognitive modeling can inform theoretical and applied research alike.

This symposium is the second of a two-part series on DDMs at TeaP. While Part I emphasizes model development, theoretical extensions, and computational innovation, Part II turns to applied research, demonstrating how DDMs can help us better understand cognitive processes across different populations and domains. By being open to scholars from all areas of experimental psychology, the series offers a forum for presenting new ideas, establishing collaborations, and identifying future directions in the modeling of human cognition.

Keywords: DDM, diffusion decision model, cognitive modeling, mathematical modeling, response time modeling, Bayesian modeling, computational modeling

Applying the Diffusion Model to Implicit Weight Bias: No Credible Evidence for BMI-Based Differences

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Implicit weight bias, defined as an automatic, unconscious negative attitude toward individuals with overweight or obesity, can be assessed with reaction time tasks such as the Affective Priming Task. Previous research using the diffusion model (DM) to analyze data from this task has shown that implicit weight bias manifests as a starting point bias, i.e., participants tended to expect a negative word more often after an overweight than after a normalweight prime. To test whether this a priori expectation is moderated by participants' own Body-Mass Index (BMI), we recruited two different groups via Prolific: a low-BMI group (self-reported BMI < 25; $N = 50$) and a high-BMI group (self-reported BMI > 30, $N = 45$). Both groups completed the Affective Priming Task with images depicting four gender-matched body types (including obese) and one neutral rectangle. Comparing responses to targets after obese versus neutral primes, neither group showed an implicit weight bias. Bayesian hierarchical diffusion modeling mirrored this finding: in neither group did starting points or other parameters of the DM differ credibly between obese and neutral primes. Descriptively, however, starting points followed the expected direction – closer to the positive boundary after obese compared to neutral primes in the high-BMI group and closer to the negative boundary in the low-BMI group – potentially indicating a weak but non-credible moderation by BMI. We discuss possible explanations for this null finding related to sample and task characteristics.

Keywords: implicit weight bias, diffusion model, starting point, Body-Mass Index

Reconciling Inconsistent Age Effects in Speed of Information Processing: The Role of Task Difficulty

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Previous research in age-related cognition has shown that older adults typically exhibit longer response times than younger adults, while their accuracy is often comparable. To better understand these differences, diffusion model analyses have been applied and have consistently revealed two key patterns: older adults tend to adopt larger threshold separations and show longer nondecision times. Findings regarding drift rate, a parameter indexing the speed of information accumulation, have been less consistent. Some studies reported higher drift rates for younger adults, whereas others found no age differences or even reversed effects. In the present research, we identified a moderating factor that may account for these inconsistencies. In Study 1, young and older participants completed three perceptual and three verbal response time tasks, each with two different levels of difficulty. As expected, we replicated the typical age-related differences in threshold separation and nondecision time. More importantly, an interaction between age and task difficulty emerged for drift rate: although younger adults generally processed information faster, this advantage was markedly reduced for more difficult stimuli. Study 2 replicated this pattern for the perceptual tasks, but not for three recognition memory tasks. These results suggest that increased task difficulty may attenuate age-related differences in information processing speed for perceptual and verbal tasks, but not for recognition memory tasks.

Keywords: diffusion modeling, age effects, cognitive speed

Forecasting Dementia in EPIC dataset: The Role of Cognitive Parameters and Demographics

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²Rensselaer Polytechnic Institute, United States

Dementia prediction remains a complex challenge. Recently, machine learning (ML) techniques have been increasingly used to improve prediction accuracy based on demographic, genetic, and neuropsychological measures. In this study, we apply a modified one-boundary diffusion model to data from the EPIC-Norfolk Prospective Population Cohort Study (2021), which includes 7,171 participants aged 48–92, 8% of whom developed dementia over a 10-year follow-up period. Participants completed the Visual Sensitivity Task (VST), a perceptual detection task designed to assess visual processing speed. A recent study by Begde et al. (2024) reported a potential relationship between visual sensitivity and dementia risk. Building on this work, we use trial-by-trial VST data to estimate cognitive model parameters increase in drift rate (reflecting visual processing speed), boundary, and non-decision time, and examine their associations with demographic variables and subsequent dementia outcomes. We conducted survival analysis in three conditions: demographics with mean RT, with RT quantiles, and with cognitive parameters. The increase in drift rate (dv) (0.76 [0.68–0.86], $p < 0.0001$), boundary (a) (1.11 [1.01–1.23], $p = 0.035$), and the interaction between age and increase in drift (1.18 [1.07–1.30], $p = 0.001$) were significant. Additionally, supervised ML algorithms were trained under three conditions: demographic information, cognitive parameters, and RT quantiles to distinguish dementia from cognitively healthy individuals. Despite the class imbalance, logistic regression classifier showed a precision of 0.25, specificity of 0.84, and sensitivity of 0.52. This study has three goals: (1) to fit a cognitive model to a large, population-based dataset, (2) to assess the relationship between demographic variables, cognitive parameters, and dementia diagnoses, and (3) to evaluate how well these parameters contribute to the prediction of future dementia risk.

Keywords: Diffusion Modelling, Dementia prediction, Cognitive impairment, Supervised Machine Learning

Using the Drift Diffusion Model to Disentangle Cognitive Effects of Gender Based Stereotype Threat Effects

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Stereotype threat refers to the negative impact of salient social stereotypes on cognitive performance. This research investigates the cognitive mechanisms underlying gender-specific stereotype threat effects using drift diffusion model analyses. Four experiments with over 900 female and male participants examined performance in mathematical tasks under stereotype threat compared to a control condition. The drift diffusion model was used to estimate parameters reflecting decision-making processes, such as speed of evidence accumulation (drift rate) and response tendencies (threshold separation). Bayesian analyses indicate that the stereotype threat induction maps on the threshold separation parameter of the drift diffusion model, signaling differences in response patterns. No substantial changes in drift rate were observed, contradicting theories linking stereotype threat to working memory depletion. These findings can help counteract the negative effects of stereotype threat on performance by specifically addressing response strategies.

Keywords: Stereotype Threat, Gender Stereotypes, Drift Diffusion Model

Modeling Common Cognitive Processes Across Flanker Tasks

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Attentional control has become a central yet debated construct in individual-differences research. Traditional measures—usually difference scores based on congruency effects—have been questioned because they show weak correlations across tasks (Rey-Mermet et al., 2018) and divergent delta-function patterns across conflict paradigms (Pratte et al., 2010), calling into doubt the assumption of a unitary construct. To address these psychometric limitations and gain deeper insight into the underlying cognitive mechanisms, we applied variants of the Drift Diffusion Model with time-varying drift rates to data from confound-minimized flanker tasks. Participants completed four-alternative forced-choice versions of arrow, letter, and number flanker tasks, as well as a matrices-based measure of fluid intelligence (HeiQ; Pallentin et al., 2023). Using Amortized Bayesian Inference, we estimated individual-level model parameters and examined shared variance across tasks using structural equation modeling. Results revealed that attentional-control-related parameters formed coherent latent factors across flanker variants, and their association with a latent fluid intelligence factor exceeded those observed for traditional difference scores. However, correlations remained modest, and high-conflict conditions following congruent trials did not differ meaningfully from those following incongruent trials. These findings suggest that computational modeling captures individual differences in attentional control more effectively than standard behavioral measures, while also indicating that attentional-control processes in the flanker task and fluid intelligence may share only limited overlap.

Keywords: Attentional Control, Intelligence, Flanker task, Drift Diffusion Model, Amortized Bayesian Inference

Part II: Source Memory - Applied Questions

Tuesday, March 17, 11:00 - 12:30, HSZ - N5

Chair(s): Désirée Schönung¹, Nikoletta Symeonidou¹

¹University of Mannheim, Germany

Source memory research aims at understanding how people remember the origin of information (e.g., Where did I read the latest news?). This double symposium brings together findings of both basic (Part I) and more applied (Part II) source memory research. Building on the theoretical and methodological framework introduced in Part I, this second part elucidates the important role of source memory in more applied contexts.

Luise Metzger opens the session with the project “Source Memory for AI- vs. Human-Generated Online Content”, which aims to investigate whether people spontaneously categorize and recall web content as human- or AI-generated. The project further explores whether people who are less trusting toward AI show better source discrimination. Oktay Ülker continues with “The Source of My Source: Effects of Learning Partner Expertise on Source Memory in Collaborative Learning”. This research examines how well individuals remember which source (trustworthy, untrustworthy, no source) their study partner cited in the collaboration phase. By additionally varying the expertise (high vs. low) of the learning partner, the study also tests schema-incongruity effects in source memory. Relatedly, in “Advice Taking on Social Media: The Influence of Source Memory for Advisor Trustworthiness on Advice Weighting” Johanna Höhs focuses on how well people remember the trustworthiness of advisors encountered on social media. The study also addresses whether enhanced source memory supports adaptive advice taking - favoring trustworthy over untrustworthy advisors. Nikoletta Symeonidou then bridges to source-memory research in specific populations. Focusing on older adults in her talk “Effects of Negative Age Stereotypes on Source Memory”, she presents findings showing that activating negative age stereotypes can impair source memory in older adults. These results highlight the importance of creating age-fair testing. Extending the discussion to (sub)clinical populations, Isabel Porstein concludes the session with “Source Monitoring Along the Continuum of Psychosis: Insights from Schizotypy.” Her research explores how subclinical schizotypy dimensions relate to source memory and source guessing biases, particularly regarding reality-monitoring impairments, which are often discussed as mechanism underlying hallucinations. The second session concludes with a general discussion, highlighting the main findings and potential implications of all contributions from a basic and applied perspective.

Keywords: source memory, trustworthiness, collaborative learning, advice taking, artificial intelligence, aging, schizotypy

Source Memory for AI- vs. Human-Generated Online Content

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The increased capabilities and availability of large language models have changed the online information landscape: Apart from traditional, human-curated sources—such as forums, news websites, or encyclopedias—, AI-generated information—such as chatbot responses or automated search summaries—is now also readily available. This research project examines whether people spontaneously categorize and recall web content as human- vs. AI-generated.

In two online studies, we adapted the “Who said what?” paradigm: Participants were shown trivia statements randomly allocated to informational websites, half of which were human- and half AI-generated. After a filler task, they then completed a source monitoring test where they were presented with both the original statements along with new distractor statements and were asked for each if it was new, or, if they assumed they had seen it previously, which website it had appeared on. We further assessed individual attitude measures and expected negative attitudes towards AI to enhance participants’ monitoring of AI-generated sources.

We analyzed the data using hierarchical multinomial processing trees with hierarchical ML estimation (Nestler & Erdfelder, 2023) based on Klauer and Wegener’s (1998) two-high-threshold model of social categorization. Initial results indicate that categorization occurs only partially.

Keywords: source memory, human factors, multinomial processing trees, artificial intelligence

The source of my source: Effects of learning partner expertise on source memory in collaborative learning

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In social learning settings, remembering both the domain information provided by a learning partner and the sources the partner used helps learners retrospectively judge the credibility of the information the partner conveyed. In other words, they need to remember the source of their source. This study investigated how learning partner expertise (between-subjects: expert vs. novice) and source credibility (within-subjects: high vs. low vs. unlabeled) affect such second-order source memory (analyzed using multinomial processing tree models) and domain learning. Participants ($N = 84$) read 21 texts (with or without a source label) on the Aztec Empire, which a bogus learning partner allegedly summarized. After a learning phase, they completed an unannounced source memory test and an announced domain knowledge test. Findings reveal that across both partner expertise conditions, high-credibility sources were remembered best, whereas low-credibility and “unlabeled” sources were remembered equally poorly. Learning partner expertise did not affect source memory but domain learning: information was better learned from experts than from novices. Exploratory analyses indicate positive relationships between classification-based source identification and domain learning. The findings support the idea of context-dependent source memory: in educational contexts, learners seem to focus on remembering high credibility sources regardless of partner expertise—possibly because they prioritize identifying which information is true.

Keywords: Source memory, Source credibility, Source guessing, Learning partner expertise, Collaborative learning, Multinomial processing tree models

Advice Taking on Social Media: The Influence of Source Memory for Advisor Trustworthiness on Advice Weighting

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¹University of Tübingen, Germany

Social media platforms such as Instagram or TikTok have become popular sources for advice. The extension of the advisor environment on social media offers new opportunities for access to high-quality advice on specialized topics. However, it also bares the risk of greater access to low-credible advisor sources (e.g., advisor sources with high expertise on specialized topics with vested interest to share advice). In two experiments, we assess people's sensitivity to advisor trustworthiness in the social media environment through a source memory lens. Following the typical advice taking paradigm, participants first provided their own estimates on health-related questions before being exposed to advice on these questions in the form of social media posts. The advice stemmed from a trustworthy or an untrustworthy advisor. Afterwards, participants completed a surprise source memory task in which they had to classify presented health advice in social media posts as stemming from one of the advisors or new. Finally, participants provided their final estimates on the health questions. In Experiment 1, we found no significant differences in source memory between trustworthy and untrustworthy advisors but that an increase in source memory increases the weighting of advice from the trustworthy source. Experiment 2 consists in a replication of these findings using a stronger manipulation of vested interest. Overall, the present research moves from the highly controlled laboratory environment towards real-life advice taking settings, thereby demonstrating source memory constraints for advisor trustworthiness despite its relevance for adaptive advice weighting.

Keywords: source memory, advice taking, social media, trustworthiness, multinomial processing tree model

Effects of Negative Age Stereotypes on Source Memory

Nikoletta Symeonidou^{1*}, Karin Häußermann¹, Beatrice G. Kuhlmann¹

¹Department of Psychology, University of Mannheim, Germany

Older adults are vulnerable to age-based stereotype threat (ST) – the concern of confirming negative stereotypes about aging, such as memory decline. Prior meta-analytic evidence suggests that ST exerts small to medium detrimental effects on older adults' performance, especially in memory tasks (Lamont et al., 2015). This experiment aimed to test the influence of expectations regarding age-related memory ability on source memory – a type of memory particularly impaired by aging. Participants ($n = 133$ younger, age range = 19-30 years; $n = 135$ older adults, age range = 60-90 years) read one of three newspaper articles describing a cruise ship designed to subtly activate negative (threat), positive (non-threat), or neutral (control) expectations about aging. The articles were pretested in a pilot study that descriptively confirmed successful threat induction. After reading, participants completed a source monitoring task in which they encoded objects presented with labels spoken by a male or female face. The study was conducted online, except for 25 older adults who preferred in-lab participation. Multinomial modeling revealed that older adults in the threat condition showed reduced source memory compared to those in the non-threat and control conditions, which did not differ. Surprisingly, the same pattern emerged among younger adults. However, further analyses indicated that perceived threat correlated negatively with source memory only among threatened older adults. Moreover, despite typical age-related declines in source memory, older adults outperformed younger adults in item memory. We discuss whether age-differences in motivation and compliance during online-testing can partially account for these results.

Keywords: source memory, cognitive aging, age-based stereotype threat, multinomial modeling

Source Monitoring Along the Continuum of Psychosis: Insights from Schizotypy

Isabel Porstein^{1*}, Désirée N. Schönung¹, Lili Sahakyan², Thomas R. Kwapil², Beatrice G. Kuhlmann¹

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Theory and empirical findings link reality monitoring impairments to positive symptoms in schizophrenia but confounds limit conclusions. Studies examining reality monitoring in subclinical schizotypy have produced contradictory results. This may be due to paradigms not assessing all types of source monitoring, overlooking schizotypy's multidimensionality, and failing to disentangle memory from guessing. Addressing this, we developed a four-source memory paradigm assessing external source monitoring, internal source monitoring, and reality monitoring. Participants view everyday objects presented with two external sources (female or a male voice speaking) and two internal sources (imagining themselves or another voice saying the object name). We extended the Two High Threshold Model of Source Monitoring (2HTSM; Bayen et al., 1996) to four sources with confirmed identifiability. Multinomial modelling separates source memory from guessing, providing accurate estimates. A pilot study with $N = 40$ participants confirmed the fit of empirical data with the model. We are currently pre-screening $N = 400$ participants with the Multidimensional Schizotypy Scale (Kwapil et al., 2018) assessing the positive, negative, and disorganized schizotypy dimensions separately. As of now, $n = 352$ have been screened of which $n = 106$ score high on at least one dimension. The scale shows good initial reliability. Later, a sample of $N = 150$ participants, including $n = 50$ scoring $> 1.5 SD$ above mean on any dimension, will be invited to take part in the piloted experiment. The three schizotypy dimensions will be entered as simultaneous predictors to estimate their unique influence on source memory.

Keywords: schizotypy, source memory, source monitoring, reality monitoring, multinomial modeling

Empirical Aesthetics: Neural, Cultural, and Experiential Dimensions of the Perception of Beauty

Tuesday, March 17, 11:00 - 12:30, HSZ - N9

Chair(s): Emily Sophie Ufken¹, Jimpei Hitsuwari²

¹University of Konstanz, Germany

²Helmut Schmidt University, Germany

This symposium explores the multifaceted nature of aesthetic experience across neural, cultural, technological, and design domains, offering a comprehensive exploration of how aesthetic judgments emerge from complex interactions between brain, body, culture and context.

Aesthetic perception will be explored across diverse fields of investigation, ranging from man-made artifacts, i.e. art and design domains, to the perception of bodies. The research presented not only enriches theoretical perspectives but also provides empirical insights as well as practical implications. Various experimental methods are used for this purpose. To be specific, the symposium contains mixed-methods research, EEG-fMRI fusion procedures, rating studies as well as cross-cultural studies.

Together, these talks highlight the richness and complexity of aesthetic experience, demonstrating that beauty is not merely a neural response or cultural construct, but a dynamic interplay of perception, meaning, and context. By integrating neuroscience, cultural studies, immersive technology, and empirical design research, this symposium offers a holistic view of how humans engage with beauty in its many forms.

Keywords: visual perception, empirical aesthetics, mixed-methods, cross-cultural, neuroimaging, art, design

The Temporal Dynamics of Art-Style Perception

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Looking at a photograph or van Gogh’s rendition of a night sky, we have no problem telling apart style from content. Yet, how the brain represents style and content has not been comprehensively investigated. Here, we created stylized renditions of 20 natural objects and scenes in seven different artistic styles (3D-render, cubism, expressionism, drawing, pixel art, renaissance, watercolor) using Stable Diffusion XL. In an EEG experiment, participants ($N = 25$) viewed the stylized images, and the original photographs used to create them, while performing an orthogonal target detection task. Representational similarity analysis revealed robust neural representations of both art style and content. As expected, we observed higher pairwise decoding accuracies between visually distinct art styles (e.g., 3D-render vs. expressionism), compared to more similar ones. Moreover, neural representations of art style peaked earlier (~ 100 ms post-stimulus) than representations of content (~ 150 – 200 ms post-stimulus), suggesting that rapidly emerging perceptual codes differentiate art styles. By assessing confusions between styles and contents, we quantified whether neural responses were dominated by style or content. Specifically, we iteratively regressed hierarchical deep neural network features out of the neural data and assessed whether the residual variance from the layer-wise regressions captured more style- or content-specific information. Our results suggest that neural style or content dominance depends on hierarchical features that vary with the abstractness of the style. In summary, we present evidence for distinct representations of art style and content, with style representations emerging early and with different representational formats for more representational and abstract styles.

Keywords: neuroaesthetics, EEG, art style, representational similarity analysis

A Cross-Cultural Study of Aesthetic Judgement in Ikebana

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This study examines cross-cultural differences in aesthetic evaluation of Ikebana (Japanese flower arrangement) across four cultures: Japan, Germany, the United States, and the United Kingdom. We investigate how cultural background, symmetry perception, and individual differences influence aesthetic judgements of 75 original Ikebana works. Three hundred participants from each culture will evaluate 30 Ikebana images on multiple dimensions: beauty, liking, positive/negative emotions, mixed emotions, and arousal. We analyze both subjective (perceived) and objective symmetry using computational measures from the Aesthetics Toolbox, controlling for low-level image features such as brightness, color statistics, and complexity. We hypothesize that Japanese participants will evaluate Ikebana more favorably due to greater cultural familiarity. We predict positive linear effects of both subjective and objective symmetry on aesthetic evaluation, with a possible inverted-U relationship for subjective symmetry. Crucially, we expect interactions between culture and symmetry: the positive symmetry-aesthetics relationship should be stronger among Western participants than Japanese participants, suggesting that cultural expertise may reduce reliance on symmetry as an aesthetic cue. Individual differences in visual aesthetic sensitivity, desire for aesthetics, Ikebana experience, and attitudes toward ambiguity will be examined as moderators. At the time of abstract submission, data collection has not yet begun. However, by the time of the conference presentation, we will present comparative results from all four countries.

Keywords: Ikebana, empirical aesthetics, cultural comparison, symmetry, aesthetic judgement, individual differences

The effect of VR-replicas on the aesthetic experience of and the learning about art

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This study examined the effectiveness of virtual reality (VR) as an extension of museum exhibitions, exploring its impact on learning and the aesthetic experience of art. Three research questions addressed whether VR-replicas—VR copies of physical exhibition rooms—can achieve learning and aesthetic experiences comparable to physical exhibitions, whether integrating photorealistic 360° images into VR-replicas enhances these experiences, and whether the museum location positively influences them. Two within-subjects studies ($N = 81$) tested these effects using a highly embodied VR-replica of two physical exhibition rooms of an art-historic museum. Participants subsequently experienced either two VR-replicas with and without 360°-images at a laboratory-location (Study 1) or a physical exhibition room and a VR-replica without 360°-images at the museum-location (Study 2). Dependent variables included knowledge-gains, sense of presence, motivation, situational-interest, motion-sickness and aesthetic experience of art. Results indicated that the VR was able to achieve similar results concerning learning and aesthetic experience of artworks compared to the physical exhibition room. Further, results showed that 360°-images caused significantly worse learning gains in VR when experienced in the first room. It is theorised that a negative novelty effect occurred due to the greater control-complexity in the 360°-VR. Lastly, analyses revealed no significant positive effect of the museum-location on learning and aesthetic experience in VR. The findings provide empirical backing for employing VRs as accessible and remote museum extensions that may be able to deliver museum-like experiences, while identifying further research gaps in confirming why exactly 360°-images had a negative effect on learning in VR.

Keywords: Context, Art-Experience, Virtual Reality, Museum Digitization, Remote Visits

Unravelling Sustainable Design Aesthetics: Empirical Perspectives from Mixed-Methods Research

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Sustainable design is gaining increasing relevance in both research and practice. This study presents qualitative and quantitative findings on consumers' evaluation of denim jeans design and their perceived sustainability. In the first experiment ($n = 39$), participants conducted a qualitative product evaluation followed by a quantitative assessment using the DynaGrid method, both before and after an educational intervention on product sustainability and circular design principles. The second experiment ($n = 34$) used the same stimuli and included a DynaGrid placement with a follow-up test at least one week later.

Our findings reveal dominant design features that influence sustainability perception, particularly the wrong heuristic that neutral, solid colours signal sustainability. We discuss the impact of the educational intervention, which did not significantly enhance participants' ability to identify more sustainable jeans but did lead to more critical evaluations of explicitly non-sustainable design elements. The qualitative data offers rich insights into participants' motivations and reasoning, informing future research directions. Additionally, we examine participants' assessments over time, to provide insight about stability of sustainability aesthetic evaluations.

While the study focuses on denim jeans, the results provide valuable implications for other product categories as well. By better understanding the psychology of product evaluations, we can enable more effective and coherent sustainable design strategies.

Keywords: Empirical aesthetics, Design, Sustainability

More than just one number: The limitation of using 2D width measures as indicator for body attractiveness

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The viral A4 waist challenge exemplifies the social media-driven pressure to achieve extreme thinness, promoting a dangerous ideal where the waist must be narrower than a 21 cm sheet of paper. This focus on minimal, two-dimensional (2D) measurements regarding female body attractiveness perception raises critical questions about how perceived body shape differs from physiological reality, particularly regarding the widely-studied Waist-to-Hip Ratio (WHR). In order to investigate this, we conducted an online rating study, using a set of 30 real women's bodies varying in weight and WHR, thus body shape. Our results show, that while 2D WHR explains more variance in attractiveness ratings than actual 3D WHR, 2D WHR measurement systematically produces lower WHR values. Moreover, adding shape information that not only account for width, but also for height ratio between waist and hip further increases the prediction of attractiveness ratings. These findings highlight the limitations of using 2D WHR values and suggest a need to first revise the widely established ideal WHR of 0.7 when considering actual 3D body shape and second, to include more complex shape information into the evaluation of body attractiveness.

Keywords: physical beauty, curviness, waist-to-hip ratio, dimensionality

New Trends in Word Learning: The Role of Prior Knowledge

Tuesday, March 17, 11:00 - 12:30, HSZ - 7E02

Chair(s): Matilde Ellen Simonetti¹, Tanja C. Roembke¹

¹RWTH Aachen University, Germany

Word learning is not limited to early childhood but rather a lifelong process. As such, it is important to investigate in what ways people's prior knowledge can shape both their ability to acquire new words as well as how these words are encoded in memory. In this symposium, we will thus explore how different types of prior knowledge—such as people's language background or knowledge about specific words—impact word learning across different ages and learning contexts. In Talk 1, Matilde Simonetti will explore how language switching influences word learning in bilingual adults. In this context, she will discuss how knowing one word in one language can differently impact the learning of a novel word form connected to the same meaning. In Talk 2, Megan Dailey will examine the role of orthography in second-language word learning, focusing on how and under which conditions orthographic input and knowledge shape the encoding of new phonological forms in memory. Relatedly, Talk 3 by Elena Markantonakis will address how prior linguistic knowledge impacts how precisely new words are encoded, with particular attention to the retention of orthographic details after learning. In Talk 4, Marie-Christin Flohr will explore how bilingual children use statistical and prosodic cues to identify word boundaries. She will focus on the influence of the second-language learners' first language and individual differences in listening abilities on their word learning abilities. Finally, in Talk 5, Nicole Altvater-Mackensen will investigate first-language word learning in preschoolers during shared book reading. She will use eye-tracking to measure how attention shapes children's learning outcomes. Together, these talks showcase new perspectives on word learning, illustrating the different ways in which prior knowledge can influence word learning in first- and second-language contexts in different age groups. The talks will illuminate the mechanisms by which prior knowledge impacts how word representations are formed in memory.

Keywords: Word learning, language acquisition, bilingualism, memory encoding, statistical learning, retention

The Impact of Language Switching on Cross-Situational Word Learning

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It is currently unclear whether language switching has a detrimental, beneficial, or neutral impact on word learning. One possibility is that language switching highlights distinctions between labels, thus making it easier to disambiguate meanings and to learn in ambiguous contexts. We tested this hypothesis by examining the role of language switching during Cross-Situational Word Learning, a paradigm in which learners are often thought to track co-occurrences between words and objects across ambiguous trials to acquire meanings. English–German bilingual adults learned 2:1 mappings in which two nonwords referred to the same object in a between-subject design. Nonwords were always presented auditorily and could either follow German or English phonotactics. In the pure condition ($N = 71$), both labels were from the same language (English or German), similar to synonyms. In the mixed condition ($N = 67$), one nonword was English and the other was German, similar to translations. Within the mixed condition, trials could be repetition trials (same language across consecutive presentations) or switch trials (consecutive presentations in different languages). As expected, learning accuracy was higher in the mixed than in the pure learning condition, suggesting that language switching can facilitate the acquisition of multiple labels for the same referent. Participants also performed better on repetition trials than on switch trials. To rule out the possibility that the auditory stimuli created from a text-to-speech system included additional cues, we are in the process of replicating Experiment 1 using recordings from a balanced English–German bilingual speaker.

Keywords: Word learning, language switching, cross-situational word learning, bilingualism, statistical learning

The impact of orthography on pronunciation in L2 word learning

Megan Dailey^{1*}

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We encounter new words in a second language (L2) by hearing them, reading them, or both (e.g., captioned multimedia). Native language (L1) orthographic knowledge influences the pronunciation of novel L2 words learned with orthographic input, such that productions are pulled towards pronunciation targets that align with L1 instead of L2 grapheme-to-phoneme correspondences 1,2,3. Results from our previous work demonstrated that the presence (vs. absence) of orthographic input in learning resulted in less dispersed, but more displaced (less native-like) productions of English vowels in pseudowords by L1 French speakers 4,5. Here, we extend this work in two directions. In Study 1, we investigated whether (L1) orthographic knowledge influences the production of L2 vowels even in the complete absence of orthographic input. French adults learned to associate 20 auditorily presented English pseudowords all with /a/ (e.g., *blop* ~ /blɒp/) with images of rare objects over the course of two days. On the third day, they named pseudowords aloud and wrote them down in separate tasks. Results showed that participant vowel productions aligned with L1 grapheme-to-phoneme correspondences of their own later-provided spellings, suggesting that in the absence of orthographic input, they generated their own orthographic representations drawing from native language experience, and that these representations influenced their productions. In Study 2, we test whether delayed introductions of spellings in learning result in productions closer to native speaker vowels. Data collection for Study 2 is ongoing, and results will be discussed in the context of the literature on the influence of orthography on L2 pronunciation.

Keywords: second language, word learning, orthography, pronunciation, phonological representations

Klokka or Klocka? The precision of memory for newly learned L2 words and the role of prior knowledge

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¹Donders Institute for Brain, Cognition and Behavior, Radboud University, Netherlands

Previous memory research has shown that prior knowledge facilitates retention of item information but hinders memory for intra-item details (Bellana et al., 2021), possibly leading to the formation of more generalized representations due to schema-based processing. In the language domain, it has been shown that cognates are better remembered than non-cognates, suggesting that word form overlap constitutes a beneficial type of prior knowledge for L2 vocabulary acquisition (Lotto & de Groot, 1998, de Vos et al., 2019). However, what constitutes intra-item detail and whether the previously found hindering effect of prior knowledge applies in the context of foreign word learning remains unclear. We examined the role of word form overlap on memory for the specific orthography of newly learned words. Dutch native participants learned pseudo-Swedish words, half of them ‘cognates’ with Dutch and the other half non-cognates, by being presented with pictures of objects and the written and spoken words. Crucially, all words contained one of five ambiguous letter bigrams that had the same pronunciation, but were spelled in two possible ways across the word set (e.g., “ck” or “kk”). Then, participants were prompted to type the newly learned words on presentation of the picture. We additionally employed a subsequent 4AFC recognition task which contained, as two of the options, the correct word with both possible spellings of the critical bigram (e.g., “klocka” or “klokka”, meaning clock). In the (not yet available) results, we expect more cognates to be recalled in general, but with less precise spelling than (recalled) non-cognates.

Keywords: word learning, prior knowledge, intra-item memory

Statistics vs. Rhythm: How first language shapes foreign language listening

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Adult learners use multiple cues to segment continuous speech, including statistical cues such as transitional probabilities (TPs) and prosodic cues such as word stress. Using a familiarization-test pupillometry paradigm adapted from Marimon et al. (2022), this study examined how French and Spanish listeners weight these cues when they conflict. During familiarization, participants heard a continuous syllable stream. In the test phase, they were presented with trochaic words (strong-weak stress, low TPs), statistical words (weak-strong, TPs of 1), or nonwords (sequences that never occurred). They indicated whether each item had appeared in the stream (word acceptance) while their pupil responses were recorded.

A GLMM on word acceptances showed a clear preference for trochaic words over both statistical words and nonwords, with no main effect of L1 and no L1 × condition interactions. Thus, both groups behaviorally prioritized prosodic over statistical cues despite differences in native-language stress patterns.

Pupillometry, however, revealed processing differences. Cluster-based permutation analyses identified significant clusters for Condition, L1, and their interactions. A long cluster indicated greater proportional pupil-size change to trochaic items in Spanish listeners, and condition contrasts showed differentiation across the test window.

Together, these results demonstrate a robust cross-linguistic trochaic preference: prosodic cues can override statistical cues even when underlying processing dynamics differ by L1. Pupillometry thus offers a valuable window into implicit cue weighting in speech segmentation.

References: Marimon, M., Höhle, B., & Langus, A. (2022). Pupillary entrainment reveals individual differences in cue weighting in 9-month-old German-learning infants. *Cognition*, 224, 105054. <https://doi.org/10.1016/j.cognition.2022.105054>

Keywords: word segmentation, cross-linguistic differences, rhythmic processing

Word Learning in the Wild

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Reading picture books with toddlers is a common activity providing rich cues for language learning: shared reading fosters vocabulary growth and general language development (e.g., O'Farrelly et al., 2018). However, little is known how children use the rich input provided by natural reading for word learning.

The current study monitored toddlers' attention during picture book reading using eye tracking glasses. A speaker presented a story book containing a novel character and a novel label, leading to a natural cross-situational word learning situation. Toddlers' gaze was continuously tracked throughout reading to assess how much time toddlers spent looking at the book vs. the speaker's face. Subsequently, toddlers' learning of the novel word-object association was assessed in a preferential looking task (Fernald et al., 2008).

Results from 43 two- to four-year-olds indicate increased target looking after labelling for trials with familiar words ($t(42)=4.9499, p < .01$) and trials correctly labelling the novel object ($t(42)=1.9957, p = .05$), but not for trials in which the novel label was mispronounced or the novel referent altered ($p < .2$). This suggests that toddlers successfully learned the novel label-object association during shared reading with sufficient detail to detect manipulations in the phonological form of the label and the semantic form of the referent. Interestingly, toddlers' general attention during book reading predicts target looking in correct trials ($r_s = .35, p = .02$) while attention to the speaker's face relates to target looking in mispronounced trials ($r_s = .38, p = .01$) pointing to an association between phonological encoding and attention to visual speech information in natural word learning.

Keywords: language acquisition, word learning, eye tracking, shared reading, attention

Part II: TVA: Measuring Attentional Changes in Diverse Populations

Tuesday, March 17, 11:00 - 12:30, C-Building - N14

Chair(s): Kathrin Finke¹, Ingrid Scharlau², Jan Tünnermann³

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Part II of the symposium on the Theory of Visual Attention (TVA) extends Part I, moving to research that highlights TVA's potential for measuring attentional changes in diverse populations, relating them to underlying neural changes, perceptual and awareness phenomena. Simon Schrenk opens with a machine-learning study linking resting-state functional connectivity to TVA parameters—visual processing speed (C), short-term visual memory capacity (K), and top-down control (α)—in healthy older adults. This work identifies distinct neural network signatures for each attentional component, providing a framework for connecting TVA-based measures with intrinsic brain organization in aging. Hannah Klink et al. follow by demonstrating that alterations within frontoparietal networks are associated with reduced top-down control in patients with mild cognitive impairment, situating TVA within altered brain-network dynamics. Thomas Sørensen presents findings on expectancy modulations interacting with the κ parameter, offering new perspectives on attentional weighting within the TVA framework. Solveig Menrad's talk relates attentional parameters in patients with ADHD to subjective and objective polysomnographic measures of sleep quality in patients with ADHD. Finally, Kathrin Finke, Jan Tünnermann and Ingrid Scharlau will discuss the development and challenges of TVA. Together, these contributions aim to chart the clinical frontiers of TVA—linking theory, neural markers, and potential translational uses in diverse populations.

Keywords: Visual Attention, Neuropsychology, Theory of Visual Attention, Computational Modeling, Aging, Theory of Visual Attention

Machine learning on resting-state connectivity reveals neural predictors of TVA parameters (visual processing speed, visual STM capacity, top-down control) in aging brains

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Introduction: Research on age-related changes in visual attention has increasingly focused on neural underpinnings, yet evidence linking individual differences in attentional functions in older adults to those in resting-state functional connectivity (rsFC) remains limited. This study used a predictive modeling approach exploring whether machine learning can reveal associations between rsFC and parameters derived from the Theory of Visual Attention (TVA) in healthy older adults.

Methods: 87 healthy older adults (mean age = 66.03 years, 62 female) underwent resting-state functional magnetic resonance imaging and TVA-based assessment of three key visual attention parameters: visual processing speed (VPS) C, visual short-term memory capacity (vSTM) K, and top-down control α . We identified the most predictive intra- and internetwork rsFC features for individual differences in each of these parameters using a machine-learning model.

Results: The model classified participants' performance in the TVA parameters with 84 to 85% accuracy. Top-down control α was best predicted by connectivity between the visual and frontoparietal (FP) networks, and between the motor (MOT) and ventral attention networks, VPS C by connectivity between FP and MOT, and vSTM K by connectivity between the default mode network with the FP and dorsal attention network.

Discussion: These results reveal distinct rsFC network associations for VPS, vSTM, and top-down control, indicating that these functions rely on separate neural processes in healthy older adults and suggesting that the respective networks are crucial for maintaining cognitive functions that may decline with age. As a next step, we will test if these results are replicable.

Keywords: Aging, visual attention, TVA, neural correlates, resting-state functional brain connectivity, machine learning

Frontoparietal functional connectivity underlies top-down control impairments in patients with mild cognitive impairment

Hannah Klink^{1*}, Kathrin Finke¹, Fabian Kattlun¹, Simon Schrenk¹, Stefan Brodoehl¹, Adriana L. Ruiz-Rizzo¹

¹Department of Neurology, Jena University Hospital, Germany

Patients with mild cognitive impairment (MCI) show reduced top-down control, the ability to ignore task-irrelevant information. It is unclear whether this reduction corresponds with decreased brain connectivity. We aimed to determine whether and how differences in functional connectivity, or the correlated activity between brain areas, explain differences in top-down control in MCI. Twenty-six patients with MCI (mean age: 71.2 ± 8.9 years; 10 females) and 29 age-matched healthy older adults (mean age: 68.2 ± 4.6 years; 9 females) underwent neuropsychological assessment to confirm diagnosis and cognitive status. We used resting-state functional magnetic resonance imaging at 3T to analyze functional connectivity. Top-down control was estimated with a theory of visual attention (TVA)-based verbal partial-report task (parameter α ; higher α indicates poorer control). We identified visual and attention-relevant functional brain networks and tested for differences between patients and controls while controlling for age and sex. Patients with MCI showed lower functional connectivity in the left frontoparietal (FPN) and visual network (VN). Patients also had worse top-down control than healthy controls ($p = 0.031$). The FPN, but not the VN, significantly correlated with top-down control across participants ($r = -0.39$, $p = 0.003$) and in the patient group ($p = -0.48$, $p = 0.014$). Moreover, FPN connectivity mediated the relationship between MCI and top-down control. These results indicate that lower FPN connectivity explains worse attentional control in MCI. Top-down control might explain memory decline in patients with MCI; longitudinal data are needed to establish prognostic value.

Keywords: MCI, attention, top-down control, functional connectivity, frontoparietal network

The Weigh of Attention - Exploring the Kappa parameter

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According to the Theory of Visual Attention (TVA; Bundesen, 1990), objects across the visual field compete in parallel for encoding into a capacity-limited visual short-term memory store. In the classical view, spatial location plays no special role and is treated as just another feature contributing additively to the attentional weight of an object. Nevertheless many TVA studies typically arrange stimuli on an imaginary circle mainly to avoid low-level perceptual confounds such as foveal–peripheral acuity differences.

However, recent work challenges this assumption. Nordfang and colleagues (2018) demonstrated robust, idiosyncratic spatial biases across individuals and showed that target and distractor weights vary across locations in a way incompatible with the classical additive TVA formulation. Instead, their results support a model in which attentional weights factor into separate spatial and nonspatial components that combine multiplicatively, implying that location exerts a structured and theoretically meaningful influence on attentional deployment. Similar spatial biases have been noted in earlier TVA datasets (e.g., Nordfang, Dyrholm, & Bundesen, 2013; Sørensen, 2012).

Here I will revisit some of our previous data (Sørensen, Vangkilde, & Bundesen, 2015) and show clear and systematic spatial asymmetries in encoding performance, even though spatial location was irrelevant to the task, and should not guide top-down prioritization. Moreover, these spatial biases appear to be systematically modulated by participants' expectations, suggesting that spatial priority maps interact with anticipatory processes in a way not captured by the traditional TVA framework.

Keywords: Attention, TVA, Attentional weights, Spatial processing, kappa

Parameters of visual attention and their associations with objective and subjective sleep parameters in adult ADHD

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Aims: Adults with ADHD often report poor sleep quality, which may contribute to their attentional deficits. However, polysomnographic evidence of sleep alterations remains sparse. We examined 1) whether objective and subjective sleep measures differ between adults with and without ADHD, and 2) how they relate to attentional performance -specifically visual processing speed C and visual short-term memory (vSTM) capacity K based on the Theory of Visual Attention (TVA).

Methods: 35 unmedicated adults with ADHD and 37 healthy controls (HC) completed 84 whole-report trials of brief letter arrays, sleep questionnaires, and one night of polysomnography. TVA-based modelling of whole-report performance estimated vSTM capacity K and processing speed C. Group differences were tested using one-way MANOVAs. Correlations and regressions examined group-related associations between sleep and attentional parameters.

Results: The groups did not differ in polysomnographic measures, but subjective sleep quality was significantly worse in adults with ADHD than in HC. Two regression analyses showed that (a) subjective sleep quality and ADHD status, and (b) subjective sleep efficiency, ADHD status, and their interaction, each significantly predicted vSTM capacity K. REM duration significantly predicted processing speed C, whereas ADHD status and their interaction did not.

Conclusions: Adults with ADHD report poorer sleep quality than HC, which is not reflected in polysomnographic macrostructure. Investigating sleep microstructure may clarify this discrepancy. Subjective sleep disturbances in adults with ADHD are associated with reduced vSTM capacity K, suggesting a link between sleep and attentional functioning in ADHD. Sleep interventions may complement ADHD treatment.

Keywords: Visual attention, TVA, ADHD, sleep

Integrating Insights from Symposium Part I and Part II: Discussion of TVA in Perspective

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The concluding discussion will bring together the themes presented in both parts of the symposium on the Theory of Visual Attention (TVA). While Part I introduced current developments in modelling, task design, and methodological extensions of TVA, Part II highlighted how attentional parameters relate to neural organisation and cognitive changes in different populations. In this final session, Kathrin Finke, Jan Tünnermann, and Ingrid Scharlau will reflect on selected points that connect these perspectives.

The discussion will focus on a small number of aspects that appear promising for future TVA research, including opportunities for integrating modelling approaches with neuroimaging findings, the refinement and practical implementation of TVA tasks in laboratory and online settings, and the role of TVA in characterising variability and change across both healthy and clinical groups. Rather than aiming for a comprehensive summary, the session will outline several directions that emerged across the talks and that may guide further development of TVA-based approaches.

By linking theoretical, methodological, and applied perspectives, the concluding discussion aims to identify areas in which TVA can continue to evolve and to support an informed exchange within the community.

Keywords: future of TVA, final discussion, attentional parameters, modeling approaches, methodological extensions, neuroimaging, machine learning

The Many Faces of Error Processing: Insights From Multiple Perspectives and Approaches

Tuesday, March 17, 16:30 - 18:00, HSZ - N1

Chair(s): Maristella Lunardon¹

¹University of Tuebingen, Germany

Everyone makes mistakes, and mistakes lead us to change the course of our action, either by stopping it or at least slowing it down, with an overall impact on subsequent decisions and behavior. Therefore, it is not surprising that human action control is governed by efficient cognitive mechanisms to monitor and regulate erroneous actions. But there is more to that. Errors not only trigger cognitive processes of monitoring and control. They are also associated with affective responses (often negative) that contribute to the chain of events initiated by the error. Moreover, although humans share basic functions for error processing, these functions may manifest differently across individuals, for example in relation to personality traits, and across contexts, such as in relation to task complexity and content.

The goal of this symposium is to provide a cross-cutting perspective on error processing research. By including contributions that use both behavioral and neurophysiological methods, the symposium seeks to bring together findings that shed light on various aspects of error processing.

The first talk examines the immediate effects of efficient error detection, which can lead to the cancellation of an ongoing erroneous action. The second talk explores the neural signatures of error processing and their links to outcomes not necessarily directly tied to mistakes. The third talk delves into individual differences, investigating how error processing relates to perfectionism. The fourth and fifth talks focus on error adjustment, offering insights respectively into affective mechanisms and into its contribution to arithmetic learning in developmental samples.

In conclusion, by providing a stage for diverse themes and methodologies in the study of error processing, this symposium set itself the task of promoting an exchange between different approaches and points of views.

Keywords: Cognitive control; Affective responses; Post-error slowing; Individual differences; Arithmetic

Error cancellation

Samuel Varga^{1*}, Roland Pfister¹

¹Experimental Psychology, Trier University, Germany

Human performance is inherently fallible, yet the cognitive system is equipped with robust mechanisms to detect and counteract errors. Traditionally, research has emphasized the role of error detection and post-error adjustments. More recent work highlights a complementary process: the immediate cancellation of erroneous actions in real time. Evidence from behavioural and electrophysiological studies suggests that error detection can feed directly into ongoing motor activity, terminating erroneous responses within the first 100 milliseconds of action initiation. This rapid intervention is reflected in shortened response durations and in neural signatures such as the error-related negativity (ERN), which may index not only passive detection but also active attempts to halt and correct ongoing behaviour. Together, these findings support a dual-process view of performance monitoring: one component dedicated to recognizing action slips, and another devoted to their swift cancellation. Understanding error cancellation has practical implications for high-stakes domains where even minor lapses can lead to serious consequences. By situating error cancellation alongside traditional accounts of error processing, this perspective underscores the importance of rapid, adaptive control mechanisms in safeguarding human performance.

Keywords: error cancellation, error processing, motor inhibition

Correct but unfavorable outcomes elicit an error positivity: Evidence from a rock-paper-scissors paradigm

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The error positivity (Pe) is a neural correlate of performance monitoring and has been associated with error awareness and the accumulation of evidence that an error has occurred. We examined whether the Pe constitutes a higher-order error signal reflecting inference-based outcome evaluation. To this end, we designed a multistage task modeled after the game rock–paper–scissors, in which the overall outcome depended on the correctness of responses across two successive stages. Notably, a correct second-stage response could yield an overall unfavorable outcome if it followed an erroneous first-stage response. We found the generally observed Pe following immediate errors within each stage. Crucially, we also observed a Pe after correct second-stage responses when these responses were associated with an unfavorable outcome. A pattern classifier trained on this higher-order Pe successfully decoded the Pe elicited by first-stage errors. Our findings suggest that the Pe reflects an evaluative process that integrates multiple response outcomes to infer the overall outcome of a multistage task.

Keywords: cognitive control, error monitoring, error positivity, error-related negativity, event-related potentials

Perfectionistic error processing: Modelling erroneous response and error evaluation

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Error processing is an essential metacognitive function that plays an essential role in everyday life. Previous research has shown that individuals differ in various indicators of error processing. For example, those with high perfectionistic concerns (ECP) exhibit reduced early error-related brain activity, whereas individuals with high perfectionistic standards (PSP) show increased late error-related brain activity and better behavioural adaptation (post-error behaviour). In the present work, we present modelling data from two distinct decision processes: (a) correct and incorrect responses in a two-choice task (Study 1, $n = 100$), and (b) evaluation decisions following responses in a main task, in which participants evaluated whether their own response was correct or incorrect (Study 2, $N = 137$). Using a hierarchical drift diffusion model (HDDM), we modelled both types of decisions—the choice leading to an error or a correct response, and the accuracy evaluation of one's own response. The HDDM results revealed a reduced drift rate in the main task for individuals high in ECP when block feedback was provided, whereas participants high in PSP showed the highest drift rate under this condition (Study 1). In the response evaluation task (Study 2), higher PSP scores were associated with higher drift rates and higher starting points. These findings are discussed within the framework of the capacity hypothesis for ECP and the optimization hypothesis for PSP.

Keywords: computational modelling, individual differences, sequences of error processing

Post-Error Slowing is Modulated by Emotional Words - Evidence for Affective Control Theories

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Few things are as instantly frustrating as realizing one made a mistake. Yet, it may be precisely this uncomfortable feeling what pushes us to pay attention, adjust, and do better next time. Affective theories of control argue that the negative or arousing quality of errors serves as feedback signal to respond with more caution. To directly test this idea, we combined a temporal flanker task with emotional words that systematically varied in affective context. We found that both arousal (emotional versus neutral) and valence (negative versus positive) of the emotional words modulate behavior following errors, consistent across a pre-registered experiment ($N = 60$) and a mega-analysis pooling this dataset with data from five other experiments employing a similar design ($N = 352$). Specifically, results showed increased post-error slowing following negative relative to positive words, supporting the idea that negative affect amplifies the aversive signal of errors. Results also indicated greater post-error slowing following high compared to low arousing words, but this effect declined with time-on-task, suggesting that the error-related orienting response habituates over time. Overall, the findings provide evidence for a functional integration of emotions and control, and we discuss potential mechanisms that may account for this relationship.

Keywords: post-error slowing, valence, arousal, cognitive control, emotion

Tracking the development of post-error slowing in arithmetic: longitudinal patterns from childhood to adolescence

Eveline Jacobs^{1*}, Shiva Taghizadeh², Stephan E. Vogel², Bert De Smedt¹, Elien Bellon¹

¹University of Leuven, Belgium

²University of Graz, Austria

Adaptive post-error adjustments are critical for learning and performance. They allow individuals to modify their behavior after making a mistake with the goal to improve task outcomes. These adjustments are typically studied in highly controlled laboratory tasks, such as Flanker or Stroop tasks. Much less is known about how people implement post-error adjustments in ecologically relevant academic contexts, such as arithmetic, where such adjustments may reflect strategic, metacognitive processes. Moreover, their developmental trajectory remains underexplored, leaving questions about how children of various ages and adolescents differ in their capacity to adapt following errors unanswered. The present longitudinal study examined post-error slowing (PES) during arithmetic performance across three age groups: 7-8-year-olds ($n = 114$), 10-11-year-olds ($n = 102$), and 13-14-year-olds ($n = 99$). Participants completed the same arithmetic task at two time points, approximately one year apart. Both cross-sectional and longitudinal results indicated reliable PES across all age groups, with a gradual decrease in magnitude throughout the primary school years. Although PES was consistently observed, its relationship with arithmetic performance was weak and limited to the youngest age group, suggesting that the functional significance of PES in arithmetic may be age-dependent. By examining PES in arithmetic, this study extends the investigation of post-error adjustments beyond laboratory paradigms, offering new insights into how children and adolescents adapt to mistakes in real-world academic tasks and how these processes develop with age.

Keywords: post-error slowing, error adaptation, mental arithmetic, metacognitive control, cognitive development

Computational Models of Language Generation

Tuesday, March 17, 16:30 - 18:00, HSZ - N2

Chair(s): Hanna Woloszyn¹

¹University of Cologne, Germany

Computational modeling has become an increasingly important approach for studying language generation across speaking, writing, and associative processes. Approaches range from distributional semantics and transformer-based architectures to learning-based production models, each providing different ways to formalize and investigate how meaning, structure, and behavior emerge in linguistic systems. This symposium presents five studies at the intersection of cognitive science, computational linguistics, and psycholinguistics that use these methods to better understand language production and related cognitive processes. The symposium starts with a study investigating whether LLM-generated corpora can simulate the longitudinal development of children's texts using various psycholinguistic variables to compare the produced language. The second talk explores whether visual characteristics of pictures, beyond their conceptual or lexical representations, contribute to interference effects in picture-word-interference tasks by integrating modern vision-language embeddings with behavioral data. The third project validates centroid analysis as a method to infer concept representations from participants' open-ended verbal responses, such as free associations, word substitutions, and feature generations with word embeddings. The fourth talk proposes a computational model that accounts for semantic interference phenomena in language production by implementing an incremental learning mechanism within an interactive production network. Finally, we present a study that investigates the psychometric capacities of LMs in the verbal fluency task, an experimental paradigm used to examine human knowledge retrieval, cognitive performance, and creative abilities. By bringing together different perspectives, the symposium encourages a discussion on what it means to "model" language production and how such modeling can contribute to our understanding of human cognition and language processing. Together, these projects will increase our understanding of language models' potential benefits and limitations.

Keywords: computational modeling; language generation; language models; psycholinguistics

LLMs as Models of Whose Language? A Longitudinal Comparison of Child and LLM-generated German Corpora

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Developmental changes in linguistic skills during literacy acquisition are prominent and fast-paced. In this study, we investigate whether LLMs can effectively reproduce such longitudinal changes in human language development. We compare texts written by children with LLM-generated texts in response to picture stories. In the chosen children's corpus, each child described one story each year, allowing us to conduct a longitudinal investigation. We generated LLM texts that reproduce the longitudinal part of the corpus. However, we employed different strategies to amend LLM prompts, each incorporating more participant-specific data. We compared human- and model-generated texts using psycholinguistic corpus analysis, focusing on lexical and syntactic analysis. We found that child texts significantly increased in length and lexical diversity with age. LLM-based corpora also showed an increase in token count with age. However, the texts were consistently longer overall and exhibited higher lexical diversity. Parts of speech also varied significantly across ages and corpora. Providing the model with additional information of varying degrees had minimal impact on the outcomes. These findings suggest that LLMs have a limited representation of child language and are unable to capture developmental changes, even when prompts are amended with detailed participant-specific information. Therefore, while LLMs may serve as useful engineering tools, for now, they cannot model child language or linguistic changes during literacy acquisition.

Keywords: LLMs, longitudinal study, child language, psycholinguistics, corpus analysis

Beyond Lemmas: Modeling the Picture in Picture-Word Interference

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Accounts of picture–word interference (PWI) typically assume that the picture has already been conceptually encoded and thus model interference exclusively at the conceptual–lexical level. In contrast, we test whether visual properties of the target picture itself contribute to interference effects in naming. We assembled a large multimodal PWI dataset— 189,767 trials from 23 experiments across 13 studies, involving more than 1,078 participants and 1,311 target images (with additional data still being collected). For each target picture and distractor word, we compute vision–language embeddings using OpenCLIP, deriving cosine-similarity measures for (a) image × distractor-word, (b) image × target-word, and (c) target-word × distractor-word pairs. These multimodal similarity estimates are integrated with trial-level behavioral data in mixed-effects models predicting log naming latencies. The project aims to assess whether image–word similarity provides explanatory power beyond traditional semantic relatedness measures and design factors. More broadly, the study offers a framework for incorporating computational visual representations into psycholinguistic models of word production.

Keywords: psycholinguistics, computational modelling, picture-word interference, vision models, language models, OpenClip

When Averages Shine: Computing Group- and Individual-Level Concept Representations Using Centroid Analysis

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While large-scale vector space models can be used to construct general, population-level meaning representations, they are often not suited for measuring concepts in specific individuals or groups, or within particular situations and contexts. To address this gap, the present work introduces centroid analysis—a computational method for quantifying variability in meaning representations by mapping open-ended verbal responses onto a semantic vector space and representing concepts as geometric centres (centroids) of the responses they elicit.

We evaluate this method using two distributional semantic models across several calculation methods, reference lexicon sizes, response types, and datasets with tasks ranging from single word substitutions to single and multiple free associations and multiple feature generation. At the group level, results show that centroid analysis performs best with multiple free associations (about 70 unique and 245 total responses per cue), using fastText for meaning-to-vector mapping for responses and cue concepts, and considering each response in the centroid calculation as often as it occurred in the data. In this setting, the cue concept is identified as the closest neighbour in the semantic neighbourhood of its response centroid in 50% of cases and within the 20 closest neighbours in 85% of cases.

At the individual level, the best results are obtained using fastText and including at least eight responses per item per participant in the centroid calculation. In this setting, the cue concept is the closest neighbour of its response centroid in 22% of cases and within the 20 closest neighbours in 60% of cases.

Keywords: centroid analysis, distributional semantics, meaning representation, concepts, computational modeling.

Semantic interference as Hebbian learning: An integrative framework

Shanhua Hu¹, Merel Muylle^{2*}, Tom Verguts², Nazbanou Nozari¹

¹Indiana University, United States

²Ghent University, Belgium

Incremental learning has been shown to underlie many psycholinguistic effects, from phonotactic and orthotactic constraint learning to structural priming. Recently, it has been proposed that cognitive control is also best understood as a learning mechanism. There is much debate about the role of cognitive control in resolving semantic interference in language production. Here, we propose a model of Hebbian learning that captures different kinds of semantic interference in language production. Specifically, the model successfully captures semantic interference effects across blocked cyclic naming, continuous naming, and picture-word interference (PWI) tasks, as well as congruency sequence effects found in PWI.

While the same Hebbian learning mechanism is applied to capture all of these effects, our simulations demonstrate that the critical learning happens in different parts of the system based on the kind of interference. When stimulus-driven information is sufficient to arrive at the correct response (i.e., when the target stimulus is more potent than the distractor), learning between stimulus and response is sufficient to capture semantic interference. In contrast, when stimulus-driven information more strongly signals an incorrect response (i.e., when the distractor is more potent than the target stimulus), the critical learning happens between task-demand and task-specific stimulus representations. In addition to accounting for behavioral findings, this framework can account for seemingly discrepant neural data obtained from a variety of semantic interference tasks.

Keywords: semantic interference; Hebbian learning; computational modelling; language production

Components of Creativity: Language Model-based Predictors for Clustering and Switching in Verbal Fluency

Özge Alacam^{1*}, Judith Sieker¹, Simeon Junker¹, Sina Zarriess¹

¹University of Bielefeld, Germany

This work investigates the psychometric capacities of Language Models (LMs) in the verbal fluency task, an experimental paradigm used to examine human knowledge retrieval, cognitive performance and creative abilities. We focus on switching and clustering patterns and seek evidence to substantiate them as two distinct and separable components of lexical retrieval processes in LMs. Specifically, we prompt different transformer-based LMs with verbal fluency items and ask whether metrics derived from the language models' prediction probabilities or internal attention distributions offer reliable predictors of switching/clustering behaviors in verbal fluency. We find that token probabilities, but especially attention-based metrics have strong statistical power when separating between cases of switching and clustering.

Keywords: verbal fluency, creativity, psycholinguistic and attention-based predictors

From Is to Ought: Grounding Rules in Regularities

Tuesday, March 17, 16:30 - 18:00, HSZ - N3

Chair(s): Roland Pfister¹

¹Trier University, Germany

Theories on how the human mind represents behavioral rules and norms distinguish between explicit, verbal formats and implicit, procedural formats. Here we ask whether the latter representational format draws on fundamental cognitive mechanisms of regularity detection and statistical learning. The symposium thus connects basic, low-level approaches from cognitive psychology to the concepts of rules and rule-guided behavior. The speakers will cover cognitive fundamentals of rule representations, principles of regularity detection and rule discovery in streams of incoming stimulation, procedural learning of rules through mental simulation, and challenges derived from using negated rather than affirmative rules to steer human behavior. The contributions cover a wide range of methodologies, from movement trajectory analysis to peripheral physiology (EMG) and neuroscientific approaches (EEG, fMRI) to elucidate the question of how much rule representations draw on implicit, procedural learning.

Keywords: rules, regularities, norms, statistical learning, procedural representations

Motivational versus cognitive approaches to rules and behavior

Roland Pfister^{1*}

¹Trier University, Germany

Research on behavioral rules and norms has typically adopted a motivational perspective to determine when human agents decide to follow or violate what they ought to do. How rules are represented in the human cognitive system, however, is surprisingly elusive. I will present key findings for a cognitive perspective on rules and norms including key challenges for grounding this perspective in basic approaches to human cognition. In addition to filling a critical gap in the current theoretical landscape, these findings also challenge common narratives that are prevalent in fields such as behavioral economics or public policy by documenting the mind's striking affinity to any rule or norm.

Keywords: rules; norms; regularities; retrieval; rule-breaking;

Sound expectations: Probing the representation of rules governing between-sound transitions using EEG and behaviour

Nina Coy^{1*}

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The auditory system has an amazing ability to rapidly encode auditory rules. Evidence comes from the classic oddball paradigm, in which frequent (standard) sounds are occasionally exchanged for rare (deviant) sounds, which then elicit signs of rule violation (e.g., MMN, P3a, performance decline). It is less clear whether deviants, which also carry certain rules, contribute to internal models of the auditory environment although they are encountered less often than standards.

To investigate this, we developed a novel, conditional oddball paradigm: two kinds of deviants differ in their probability of repetition. Depending on repetition probability, the sound actually following a deviant (another deviant or a standard) is conditionally likely or unlikely. Independently, this sound is either unlikely (deviant) or likely (standard) with respect to the global rule (i.e., overall stimulus probability). This dissociation allows for probing rule extraction from rare events.

I will present robust empirical findings at the level of response times and false alarm rates (three studies, altogether 160 participants), demonstrating that conditional rules associated with rare deviants can be extracted when behaviourally relevant (active deviant detection task). I will discuss electrophysiological findings in a passive listening setting (two studies, altogether 120 participants) with respect to what rules the auditory system relies on when all sounds are to be ignored.

Altogether, I will show how disentangling the type of information (conditional vs global probability) from the frequency of rule encounters (rare vs frequent) provides novel insights into how our brains cope with the complexity and dynamics of the world.

Keywords: auditory prediction, EEG, rule learning, perception, oddball, behaviour

Behavioral and neural signatures of extracting regularities from relevant and irrelevant sequences of sound

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The human auditory system is constantly exposed to a wide variety of sounds. Some sounds are behaviourally relevant, while others are irrelevant and potentially distracting. Since processing capacities are limited, the auditory system is hypothesized to rely on inter-trial dependencies in sound sequences to support enhancement of relevant sound and suppression of distraction. We investigate how the recent history of sensory input modulates the deployment of reactive attentional capture and suppression. On every trial, participants ($n = 34$) searched for an amplitude-modulated target sound presented simultaneously with salient and non-salient distractors (German spoken monosyllabic number words). Behaviorally, we observed distractor suppression as decreased performance in trials where the current target shared features with the distractor from the previous trial (i.e., negative priming). Target enhancement surfaced in increased performance in trials where the current target shared features with the previous target (i.e., positive priming). Over the course of the experiment, performance in trials with distractors relatively increased, indicating a gradual transition from attentional capture to more successful distractor suppression. In the electroencephalogram (EEG), lateral targets evoked an N2ac component in the event-related potential (ERP), speaking to reactive attentional enhancement. In contrast, lateral distractors evoked a distractor positivity (Pd) component, which has previously been associated with reactive inhibitory attentional processing in the visual modality. In summary, we demonstrate that the auditory system utilizes spatiotemporal inter-trial dependencies to reactively enhance relevant sounds, while suppressing distractors.

Keywords: selective attention, auditory, EEG, serial dependency, target enhancement, distractor suppression, attentional capture

Rule encoding by mental simulation

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Rules exert a powerful influence on human behavior. They even shape human action through instructions without any previous experience of following the rule. Here we suggest that rules become ingrained deeply into the human cognitive system because encoding a rule entails mentally simulating an instance of rule following. We tested the mental simulation hypothesis by measuring sub-threshold muscular activity in the left and right forearm via electromyography (EMG) while presenting rule instructions mapping a stimulus to either a left or a right key press. As predicted, EMG activity during instructions was higher in effectors targeted by an instruction as compared to non-targeted effectors. Mental simulation, therefore, likely represents a key mechanism that ingrains a rule into the cognitive system and paves the way for later retrieval of rule-based behavior.

Keywords: Rules, Instructions, Mental Simulation, Mental Imagery, Electromyography

Implementation and recognition of novel negatively instructed stimulus-response rules

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Instruction-based learning (IBL) is an essential human skill, enabling flexible and efficient application of novel rules. In most studies, instructions specify affirmative (or positive) stimulus-response (S-R) rules (i.e., if condition A, then execute action X). In this talk, however, I will focus on so-called negative instructions (i.e., if condition A, then do not execute action X but execute alternative action Y or Z) and present some insights from recent behavioral and functional magnetic resonance imaging (fMRI) studies.

Behaviorally, relative to ad-hoc negation of previously established neutral S-R associations, actual negative instructions seemed to induce proactive preparatory processes, resulting in greater implementation efficiency. However, when compared to standard positive instructions, rule implementation still came with considerable costs. I argue that this is mainly due to the interplay of two dissociable representations in negative instructions: The originally negated, instruction-related S-R association (i.e., A-X) persistently influences instruction implementation while an implementation-related S-R association (i.e., A-Y or A-Z) gains increasingly stable control across repeated implementation trials.

At the neural level, we attempted to capitalize on this property by applying multivariate pattern analysis sensitive to individual rule identities. Irrespective of instruction type, rule identities were represented in a set of lateral prefrontal and parietal cortical areas. However, there was no evidence for a dynamic representational change in any of these regions.

I will discuss the implications of these findings and how further examination of negative instructions could advance the general understanding of initial instruction-induced learning processes.

Keywords: Instruction, rules, negation, representation, fMRI

Emotional-Semantic Mapping: Mixed-Method Tools for Uncovering Belief Systems

Tuesday, March 17, 16:30 - 18:00, HSZ - N4

Chair(s): Julius Fenn¹

¹University of Freiburg Institute of Psychology, Cognition, Action, and Sustainability; Cluster of Excellence Living, Adaptive and Energy-autonomous Materials Systems (livMatS), Germany

Understanding belief systems requires insight into the mental models that underlie how individuals represent and reason about complex or contested phenomena, such as disruptive technologies or political discourses. Mental models are internal representations that describe how people understand the structure and functioning of external systems. They form the cognitive foundation of laypersons' belief systems and shape how information and values are integrated. To investigate such belief systems, methods that capture both explicit and implicit layers of meaning are needed. This symposium presents two complementary approaches for mapping mental models that differ in their degree of explicitness and the level of participant engagement required. At the explicit end, Cognitive-Affective Maps (CAMs) visualize belief systems as networks of emotionally evaluated concepts and relations. At the more implicit end, the Triads Task captures belief systems of individuals and groups in a standardized way, based on ratings of the similarity of three stimuli.

Julius Fenn (University of Freiburg) presents tools that make CAMs applicable within experimental paradigms. These tools enable researchers to manipulate belief structures, measure changes in affective-cognitive coherence, and integrate CAMs as dependent or independent variables in controlled designs. René Dutschke (TU Dresden) presents its roots in Kelly's theory of personal constructs and showcases its applications as a research tool. Irina Monno (University of Freiburg) explores the potential of CAMs as a method to capture and measure changes in belief systems by visualizing shifts in cognitive and emotional structures. Michael Gorki (University of Freiburg) uses CAMs alongside questionnaires to examine how "laypersons" conceptualize sustainability, a highly contested concept in public, academia and policy-making. Bettina Harder (University of Erlangen-Nuremberg) evaluates the use of CAMs in diagnostic and counseling contexts. CAMs have proven to be helpful diagnostic tools by providing in-depth information in a structured way, thereby identifying individually relevant starting points for interventions to deal with stress or test anxiety.

Together, these approaches demonstrate a continuum of mapping techniques, from explicit to implicit. By highlighting their advantages, limitations, and practical potential, the symposium provides insights into new methods for investigating belief systems related to technological, ethical, psychological, and societal issues.

Keywords: cognitive-affective maps; triads task; mental models; belief systems; semantic networks; mixed methods

Developing Advanced Tools for Cognitive–Affective Mapping: Possible Applications for Experimental Research

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²Cluster of Excellence livMatS @ FIT–Freiburg Center for Interactive Materials and Bioinspired Technologies, University of Freiburg, Germany

Cognitive–Affective Maps (CAMs) provide a structured method to capture how individuals organize concepts, associations, and emotional evaluations within a network-like representation. Although originally introduced as a mixed-methods tool, CAMs can be systematically embedded into experimental paradigms. Researchers may manipulate the initial network structure (e.g., predefined central or opposing concepts), the affective or informational context, or task constraints during map construction. The resulting CAMs serve as sensitive dependent variables that reflect cognitive–emotional processing and change.

We present Cognitive–Affective Map Extended Logic (C.A.M.E.L.), a software suite that enables such applications. Its data collection tool allows participants to construct or modify CAMs under standardized, fully configurable conditions. CAMs can contain graded emotional evaluations, weighted supporting or opposing connections, directional arrows, and typed semantic content, producing a complex data structure suitable for quantitative and qualitative analysis. The accompanying CAM-App supports preprocessing, semantic clustering, and network-level quantification (e.g., mean valence, density, neighborhood indicators) through transparent, protocol-based analysis pipelines. A web-based administrative panel facilitates study setup, configurations of parameters, and participant management.

This framework accommodates diverse experimental designs: CAMs as dependent variables in pre–post studies; CAMs as independent variables via predefined network; and adaptive paradigms in which real-time CAM analysis trigger subsequent tasks or feedback.

By integrating emotional evaluation, semantic associations, and graph structure into a different format, C.A.M.E.L. advances the study of cognitive–affective processes such as coherence formation, attitude change, and belief updating in the context of mental models.

Keywords: cognitive–affective mapping, emotional evaluation, experimental methods, network analysis, belief updating, attitude change, mental models

Same, same, or different? The repertory grid technique as a basis for capturing belief systems

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People's positions towards broad and complex topics are best captured not by single attitudes and beliefs, but rather by focusing on broader belief systems. Investigating belief systems necessitates a focus on the interconnectedness of concepts within people's mental models. The repertory grid technique, with its theoretical foundation in Kelly's personal construct psychology, is a promising approach to capture the complexity and interconnectedness of belief systems. It is based on the idea that people make sense of the world by developing a set of internal reference axes, and subsequently using these for evaluating and anticipating events, concepts, and objects. The constitutive procedure behind the repertory grid relies on a person making similarity and difference decisions for three stimuli (i.e. concepts, objects) at a time to get an understanding of this person's set of reference axes. This talk shows two adaptations of the repertory grid for capturing belief systems. The triads task is presented as a standardized, computerized, retest-reliable procedure to measure and visualize belief systems of individuals and groups in form of cognitive-affective maps (CAMs). Repertory grid interviews on the other hand offer a semi-structured approach yielding qualitative and quantitative outcomes as a means to get an in-depth understanding of a person's belief system. Data and results from both approaches will be presented to illustrate the versatility and practicality of the Repertory Grid technique to capture belief systems.

Keywords: belief systems, repertory grid, triads task, cognitive-affective maps, mixed-methods

Visualizing Mental Models: Three Applications of Cognitive-Affective Mapping in Research and Practice

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Cognitive-Affective Mapping (CAM) is a visual-analytical method that has been applied across various research domains, such as conflict resolution (Findlay & Thagard, 2014), the assessment of emerging technologies (Fenn et al., 2023), and the analysis of societal perceptions, for example in the context of the COVID-19 pandemic (Mansell et al., 2021b; Reuter et al., 2021). Evidence suggests that the method can be integrated into different research designs, including cross-sectional and longitudinal studies as well as adaptive designs with real-time feedback. Beyond its diagnostic potential, CAM also serves as a tool for process facilitation. For example, reflecting on one's own or others' CAMs can encourage individuals to question their positions, thereby increasing the likelihood of compromise and mutual understanding (Homer-Dixon et al., 2014; Gros et al., 2021). Moreover, recent findings indicate satisfactory inter-rater reliability, supporting the use of CAM as an evaluation instrument (Gros et al., 2024). This contribution illustrates the methodological and practical versatility of CAM through three studies. The first describes a research-oriented application examining whether anticipated concerns about the transition to open office spaces corresponded to actual cognitive and emotional responses. The second example demonstrates an application-oriented use in which CAM supported the moderation and improvement of intergroup dispute. The third case combines both perspectives, employing CAM to evaluate the effectiveness of an intervention in the context of migration. Together, these examples highlight CAM's potential as a robust, flexible, and reflexive instrument for capturing, facilitating, and evaluating changes in belief systems.

Keywords: cognitive-affective maps, mental models, organizational change, intergroup dispute, social intervention

Understanding "Laypersons" Conceptualizations of Sustainability - Mapping a Contested Concept

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Sustainability is a key mission statement for industrialized societies, yet its exact conceptualization is contested in academia and policymaking. At the same time, there is little knowledge on how "laypersons" (persons not actively engaged in academic theory debates on sustainability) conceptualize the meaning of sustainability (Geiger & Swim, 2021). Drawing from an online study of 296 participants, we analyze Cognitive-Affective Maps (CAMs) and questionnaires to map out how individuals from diverse socio-political backgrounds conceptualize sustainability.

Taking a multi-method approach for analyzing the CAM data, we employed quantitative as well as qualitative analyses. Based on the established three-pillar model of sustainability we investigated the interplay between ecological, economic, and social pillars in laypersons' conceptualizations of sustainability. In doing so, we investigate whether their mental models align with or diverge from the established three-pillar model. We complemented this "top down" analysis with a more fine grained "bottom-up" content analysis. We then employed regression analyses to further investigate whether persons of similar general socio-political views (cultural cognition worldview and political party affiliation) tend to share similar conceptualizations of sustainability. Our results show meaningful differences between the three pillar model and "laypersons" conceptualizations. In particular, only a minority of participants mentioned any aspect related to social sustainability at all. Furthermore, participants of similar socio-political views tended to share similar conceptualizations of sustainability. Geiger, N., & Swim, J. K. (2021). Understanding lay individuals' mental models of sustainability.

In F. Weder, L. Krainer, & M. Karmasin (Eds.), *The sustainability communication reader* (pp. 301–321). Springer. https://doi.org/10.1007/978-3-658-31883-3_17

Keywords: Sustainability, Environmental Psychology, Political Psychology, Cognitive Affective Maps, Contested Concepts

Using Cognitive-Affective Mapping as a Diagnostic Tool to Support Individual Development

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Test anxiety and stress symptoms in general have become alarmingly common among university students. Supporting student development and helping them manage study demands in a healthy, sustainable way requires individual diagnostics followed by tailored intervention. Diagnostics should be economic and standardized on the one hand, and deliver in-depth information on the particular constellation of relevant factors on the other hand, often leading to a trade-off. In a first study with $N = 19$ students, I compared the diagnostic value of cognitive-affective mapping (CAM), an economic and, at the same time, individual, in-depth method, with extant standardized anxiety measures in the context of procrastination behavior and general resource availability. In the week before their end-of-term exams, students who nominated themselves as test-anxious were asked to map their associations with their most feared exam (CAM) and to complete the standard questionnaire scales. It turned out that CAM valence correlated well with standard measures of test anxiety, especially with cognitive aspects, and to a lower degree than standardized measures with procrastination and available resources. However, individual profiles composed of the mentioned measures varied substantially. The highly individual interplay of influential factors underscored the need for detailed case diagnostics, which CAM visualized quickly and explicitly in an easily accessible way. Therefore, it proves high potential as a diagnostic instrument in counseling practice.

Keywords: Cognitive-Affective Mapping, diagnostics, counseling, test-anxiety, stress, university

Current Directions in Prospective Memory Research

Tuesday, March 17, 16:30 - 18:00, HSZ - N5

Chair(s): Wiebke Hemming¹, Fabian E. Gümüşdaglı²

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Prospective memory (PM) refers to the ability to remember intended actions and execute them at a specific time point (time-based PM) or in response to a specific event (event-based PM) in the future (for an overview, see Bayen et al., 2024). PM is pivotal for goal-directed behavior in everyday life, and everyday errors frequently involve PM failures (Crovitz & Daniel, 1984; Kvavilashvili et al., 2001; Terry, 1988). Over the past decades, PM research has evolved into a broad field encompassing laboratory paradigms, naturalistic studies, neurophysiological studies and metacognitive and cognitive modeling approaches. Despite this progress, many of the key questions remain unanswered about the mechanisms supporting PM across different contexts, time frames, and age groups. This symposium brings together recent advances from diverse domains of PM research. The first talk focuses on the functional neuroanatomy of event-based and time-based PM in healthy older adults. The second talk examines age differences in metacognitive monitoring and control processes in PM, focusing on how these mechanisms support the management of intentions across adulthood. The third talk focuses on a metacognitive path model of time-based PM, tested empirically on multiple datasets. The fourth talk introduces a novel bi-factor modeling approach that separates bottom-up spontaneous retrieval from top-down preparatory processes in event-based PM. Finally, the fifth talk introduces a new cognitive model that disentangles the prospective component—remembering that something must be done—and the retrospective components of event-based PM, namely remembering what must be done and when. Together, this symposium provides an integrative perspective on current theoretical and methodological developments in PM research and concludes with a discussion of challenges in measuring PM performance and promising directions for future work.

Keywords: prospective memory, episodic memory, metacognition, neural correlates, modeling

The functional neuroanatomy of event-based and time-based prospective memory

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Prospective memory anchors upcoming activities in future time and space either cued externally (event-based prospective memory) or internally (time-based prospective memory). It is key to remain autonomous and can be enhanced using incentives. To examine the neuronal underpinnings of prospective memory and any performance improvement, we randomly assigned 58 healthy older participants (60-75 years old, 36 women) to event-based and time-based prospective memory tasks using 7T-fMRI, with or without incentives.

Event-based and time-based PM differed in their functional neuroanatomy. Event-based tasks required activity important for the perception of relevant changes in the environment and for adapting the focus of attention to then respond swiftly. Time-based tasks, in contrast, involved regions supporting cognitive control or serving as a multimodal information buffer. Incentives had no effect in time-based prospective memory but recruited brain regions important for attention thus improving cue recognition in event-based prospective memory.

This highlights the differences between these two prospective memory types and the need for differential approaches depending on the type of memory demand.

Keywords: fMRI, prospective intentions, ageing

Age Differences in Monitoring and Control: Metacognitive Insights into Prospective Memory

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Remembering to carry out intended actions in the future – such as taking medication or attending an appointment – is essential for maintaining autonomy and independence in everyday life. As we grow older, this ability, known as prospective memory, can become more challenging. Yet, people are not passive in the face of cognitive change: they adapt by using strategies to support their memory. One important mechanism that enables such adaptation is metacognition – our capacity to reflect on and regulate our own thinking. Metacognition involves two key processes: monitoring, or evaluating how well we are doing, and control, or adjusting our behavior based on that evaluation. Effective cognition depends on the dynamic interaction between these two processes. For instance, recognizing that we might forget an intention can lead us to set an external reminder, a strategy that can protect against everyday cognitive failures and help maintain successful everyday functioning. In this talk, I will present recent studies comparing younger and older adults to examine age differences in how metacognitive monitoring and control support prospective remembering. I will discuss how people decide when to rely on external reminders, how accurately they judge their own memory performance, and how contextual factors – such as age-related stereotype threat – can influence these metacognitive processes. Together, these findings highlight both age-related differences and shared adaptive mechanisms, offering new insights into how metacognition supports flexible strategy use and the maintenance of independence across adulthood.

Keywords: Prospective memory, metacognition, cognitive offloading, cognitive ageing

The Role of Metacognition in Time-based Prospective Memory

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Time-based prospective memory (TBPM) - the ability to remember and execute delayed intentions at the right time - depends on strategic time monitoring and metacognitive processes. Despite theoretical proposals, formal empirical support for TBPM metacognitive models remains limited. Across three datasets, we tested a path model integrating self-initiated monitoring, strategic control, and confidence-based awareness.

First, a large-scale dataset ($N = 2'079$; Geneva Space Cruiser task) was used to test the overall path model structure. Results supported the predicted relations between absolute and relative clock-checking, metacognitive confidence, and TBPM accuracy, revealing partial mediation by strategic monitoring.

Second, a laboratory study compared younger ($N = 56$) and older adults ($N = 57$). Younger adults' monitoring appeared more automatic and less dependent on explicit metacognitive awareness, whereas in older adults, higher metacognitive awareness predicted better PM performance through enhanced self-initiated checking. These findings indicate age-specific mechanisms supporting strategic monitoring and awareness.

Third, an experiment (OSF pre-registration: <https://osf.io/bd8fj>) was conducted to manipulate ongoing task (OT) difficulty while assessing metacognitive confidence in time monitoring, OT, and PM performance. This design aims to test the causal involvement of metacognition in adaptive monitoring strategies under different cognitive loads. Overall, we expect that increasing OT load impairs strategic time monitoring and PM performance, but that higher metacognitive awareness will mitigate these effects by enabling adaptive adjustments of strategic time monitoring.

Together, this joint analysis provided convergent evidence for a metacognitive framework of TBPM, identifying when and how metacognitive monitoring supports prospective remembering across adulthood.

Keywords: delayed intentions, metacognition, time monitoring, structural model

A Bifactor Modeling Approach to Individual Differences in Prospective Memory Processes

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Event-based prospective memory (PM) is the ability to remember to execute an intended action in response to an external cue. According to the Dynamic Multi-Process Theory, successful PM performance involves two cognitive processes interacting in a dynamic fashion: top-down monitoring and bottom-up spontaneous retrieval. In this study ($N = 175$), we investigated individual differences in PM performance using a bifactor modeling approach to separate top-down and bottom-up PM processes. We further measured attentional control and fluid intelligence as underlying factors of PM. Participants completed a 2-back task with PM targets that were either focal, reflecting both bottom-up spontaneous retrieval processes and top-down monitoring, or non-focal, reflecting top-down monitoring processes. The target focality effect was replicated, showing better a PM performance and faster response times in the focal condition compared to the non-focal condition. Structural equation modeling confirmed separate PM factors for top-down monitoring and bottom-up spontaneous retrieval that contribute differently to focal and non-focal PM. Top-down PM was correlated with attentional control, while bottom-up PM was not. Fluid intelligence was only marginally related to top-down PM, and this effect was fully mediated by attentional control. The findings suggest that individual differences in PM performance are best understood by separating the underlying cognitive mechanisms.

Keywords: event-based prospective memory, fluid intelligence, attentional control, target focality, structural equation modeling

A New Multinomial Model of Prospective Memory: Validating the Retrospective What Component

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¹Heinrich Heine University Düsseldorf, Germany

Remembering to perform an intended action when a specified event occurs in the future is referred to as event-based prospective memory (PM; see Bayen et al., 2024, for an overview). Successful PM involves several cognitive processes: remembering that something must be done (prospective component), remembering when it must be done (retrospective when component), and remembering what must be done (retrospective what component). Smith and Bayen (2004) developed the multinomial processing tree model of PM, which allows us to disentangle the prospective and retrospective when components, but not the retrospective what component. We extended this model by introducing new parameters and response categories to disentangle all components of PM. To validate the new parameter representing the retrospective what component in line with the strong validation criterion (cf. Schmidt et al., 2025), we conducted an experiment ($N = 256$) designed to selectively affect this parameter while leaving all others unaffected. Participants performed an ongoing task and were additionally instructed to press one of two keys (F1 or F8) when a pre-learned word appeared, with specific words assigned to specific keys. We manipulated the encoding difficulty associated with the key by varying the learning sequence: One group first learned all words for one key (e.g., F1) and then all words for the other key (e.g., F8), whereas the other group alternated between keys during learning. Consistent with the strong validation criterion, only the parameter representing the retrospective what component was affected by the manipulation, thereby supporting its construct validity.

Keywords: Event-based prospective memory, multinomial processing tree models, cognitive modeling, validation.

Empirical Aesthetics - Experimental Approaches to the Question Why We Like and Dislike Things

Tuesday, March 17, 16:30 - 18:00, HSZ - N9

Chair(s): Thomas Jacobsen¹, Bettina Rolke²

¹Helmut Schmidt University / University of the Federal Armed Forces Hamburg, Germany

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Our aesthetic experience of external stimuli is shaped by our cultural and individual backgrounds, as well as by various perceptual, cognitive and emotional processes. Empirical research has identified numerous factors that influence our aesthetic perception of stimuli, including their characteristics and the context in which stimuli are perceived. Recently, the question has also been raised about the impact of engaging with art on other areas of life. This symposium will present various approaches to empirical aesthetics research. In the first talk, Barbara Mühlbauer will ask whether two evaluation methods — rating and pairwise comparison — produce comparable aesthetic judgements and how stable these judgements remain over time. Claudia Muth's second talk will address how specific stimulus characteristics, such as the complexity of visual matrix patterns and ambivalence in artistic photographs, influence various components of aesthetic perception. She will also report results concerning the relationship between these characteristics and eye movements. In the third talk, Ronald Hübner will explore potential causes of individual preferences for different visual spiral patterns, attributing them to individual creative dispositions. In the fourth talk, Gemma Schino will explore the affective and cognitive changes that arise from engaging with meaningful artwork through interactive analysis and interaction with others. She will present a model that considers the interactive contribution of affect and cognitive strategies, drawing a connection to the general influence of emotional processes on cognition. In the final talk, Jan-Filip Tameling will present a cognitive network model mapping the concepts relevant to experiencing art. He will propose a visual art schema that could help identify the cognitive mechanisms involved in aesthetic experiences. Overall, the symposium provides a comprehensive insight into the multifaceted world of empirical aesthetics research, offering an overview of the various approaches, models, and perspectives employed.

Keywords: empirical aesthetics, cognition, emotion, visual art schema, rating, pairwise comparison

How to measure beauty? Comparing ratings and pairwise comparisons of different stimuli

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In most empirical aesthetic research, data on the aesthetic appeal of stimuli is obtained by asking participants to rate them on a Likert scale, requiring them to indicate, for example, their perceived beauty on a scale from 1 (not at all beautiful) to 7 (very beautiful). This rating method has many advantages, as it is easy to implement and allows multiple dimensions of an aesthetic impression to be evaluated simultaneously. However, it is uncertain whether data collected with a different method such as pairwise comparison yield similar results. Furthermore, it is unclear how stable individual aesthetic judgments are. Estimating the variance of aesthetic judgments is particularly important because rating studies typically only ask for one judgement.

We investigated these questions in two studies. In the first study, we compared judgments of the beauty of chair images, which were collected using either ratings or pair comparisons. To check the judgements' stability over time, each measurement was repeated ten times. The beauty assessments obtained using the two methods were very similar. These results demonstrate that both methods effectively capture aesthetic judgements. Furthermore, strong positive correlations were obtained between measurement repetitions within participants, suggesting that their opinion of beauty is stable and does not change substantially over time. In the second study, we used abstract artworks to test whether these results could be generalized to other stimuli. In summary, this systematic comparison of the two evaluation methods provides insights into their respective advantages and disadvantages, which will be discussed in the talk.

Keywords: empirical aesthetics, data collection, method comparison, rating, pairwise comparison, judgment stability

Stimulating potentiality: effects of variation and ambivalence on interest

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²Group EPÆG (Ergonomics, Psychological Æsthetics, Gestalt), Bamberg, Germany

A potential for meaningful experiences can cause interest and motivate active perception – especially when perceptual routines are challenged. We examined two phenomena that might offer such a stimulating potentiality in very different ways: (a) complex variation of perceptual order in patterns and (b) awareness of ambivalence in artistic photographs. (a) Students trained in design and/or fine arts created visual patterns on a 6×6 grid. These patterns were rated by another group block-wise on a 7-point scale on liking, interest and stimulation. Additionally, they reported on why some of the presented images might have stimulated them. Complex variations of elements (but not deviations from order) were more interesting and stimulating than repetitions. Obviousness of order seemed relevant for liking only. And qualitative reports highlighted the stimulating potentiality of perceptual transformation and incompleteness. (b) In another study, we manipulated participants' awareness of the ambivalence of photographed scenes by asking them to explore positive and negative interpretations of each image. Ratings of ambivalence were positively related to those of interest; the latter even increased after listing positive and negative interpretations. The effect of ambivalence on interest was also shown in a follow-up study using eye tracking in a forced-choice design: Participants chose ambivalent photographs more often and looked slightly longer at them when asked which of two images they wanted to learn more about. We consider perceptual and affective dynamics underlying the reported effects and discuss the role of experience in art and design, individual goals, and (artistic) context.

Keywords: order, interest, ambivalence, dynamics, design, art

Aesthetic Preferences for Spirals: A Window into Creative Cognition

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The interplay between universal principles and individual variability in aesthetic preferences remains a fundamental question in art and design. Considerable individual differences observed even for simple stimuli such as rectangles support Fechner's (1866) early view that preferences are due to both innate mechanisms and acquired associations. This is consistent with our recent work, which shows that the preferences for simple design elements such as different types of spirals also vary individually. In particular, we were able to identify different subgroups: Some participants preferred golden spirals over Archimedean spirals, others showed the opposite pattern, and a third group showed a slight preference for logarithmic spirals. Although personality traits did not clearly correlate with these preferences, initial evidence suggested a relationship between the preference groups and creativity. To further explore this, a subsequent study not only required participants to choose among the three spiral types but also to articulate their reason and associations. The findings strongly indicate that individuals preferring the golden spiral tend to exhibit higher creativity than those favoring the Archimedean spiral. This observation was corroborated by a further experiment with design experts and artists. They showed a significantly higher preference for golden spirals compared to a control group. Overall, these studies suggest that a preference for relatively simple design elements, such as spirals, can serve as an indicator of a person's creative disposition.

Keywords: Aesthetics, associations, creativity

Sense-Making and Emotion in art and meaningful objects: Exploring the interplay between cognition and affect

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Art fosters self-reflection and interpersonal understanding through emotional and cognitive engagement. This interdisciplinary study explores the interaction between epistemic emotions and sense-making during art reflection. Eighteen dyads of adults ($N = 36$) participated in a study where each brought a personally meaningful artwork and discussed it with a peer in a recorded, semi-structured conversation. Emotional responses were measured through pre- and post-conversation self-reports, and a sentiment analysis of the conversation provided dynamic affective data. Sense-making strategies were qualitatively coded using perception, imagination, conceptualization, and analysis (based on van Heusden, 2015).

Results showed that conceptualization evoked the most intense emotional responses, while sentiment analysis revealed distinct affective patterns across sense-making strategies. Emotional engagement was integral to all strategies, suggesting that epistemic emotions are essential to sense-making in art experiences. A Multinomial Log-linear Model demonstrated that affect and cognitive strategies interact to shape perceived emotional responses to art.

Crucially, interaction with another person led to measurable affective changes, highlighting the socially situated and intersubjective nature of understanding of, during and with art experiences. These findings support the 4E approach (where the four E's stand for Embodied, Embedded, Enactive, and Extended cognition) and potentially extend it to incorporate Emotions as part of any cognitive process.

Keywords: sense-making, affect, semiotics, art experience, sentiment analysis, exploratory graph analysis

The visual art schema: A cognitive network analysis of content and structure

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Interpreting a situation as an art reception situation alters how stimuli are perceived and evaluated. Theories of aesthetic experience highlight this recognition of an art context as a crucial precondition for aesthetic processing. However, the cognitive basis of this recognition remains underspecified. Existing models either omit a cognitive account altogether or refer to an art schema, the mental representation of art reception, as a narrative placeholder. We address this gap by developing a network model of the art schema that—grounded in schema theory—empirically explicates its content and structure. In a first study, participants provided free-listings to identify the most important concepts associated with situations of visual art reception. In a second study, pairwise association ratings for those concepts were collected to construct a weighted concept network, which we analyzed with graph-theoretical metrics to assess its structure. This empirically derived network model of the art schema encompasses central aspects of art situations, including artworks, the exhibition environment, and the responses they elicit, encompassing emotional, behavioral, and cognitive dimensions. Its structure is highly cohesive and efficiently organized, with structural features indicating dense interconnections, integrated organization, and rapid activation. Hierarchical clustering further revealed nested subschemata, suggesting a hierarchical and interconnected organization. These findings provide the first empirically grounded, specified model of the art schema, clarifying how recognition of art contexts is realized and what cognitive, emotional, and behavioral reactions it guides.

Keywords: schema, aesthetic experience, visual art, network modeling

New Directions in the Study of Bilingual Language Control

Tuesday, March 17, 16:30 - 18:00, HSZ - 7E02

Chair(s): Tanja C. Roembke¹, Matilde Ellen Simonetti¹

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Bilinguals require language control to regulate the activation of their known languages. Language switching paradigms are commonly used to investigate the processes underlying bilingual language control. Several approaches fall under the umbrella term “language switching,” whose defining feature is the alternation between languages, thereby requiring bilinguals to select one language over another on each trial. In this symposium, five talks present innovative research using language switching to explore language control processes in both comprehension (Talks 1-2) and production (Talks 3-4). Across studies, different paradigms (e.g., picture naming, voluntary switching, sequential switching) and methodologies, from behavioral measures to virtual reality, are employed. The focus extends beyond single-word processing to include also sentence-level processing. In Talk 1, Aaron Vandendaele examines proactive control mechanisms during language switching using a semantic classification task involving written word categorization. Luigi Falanga (Talk 2) investigates the flexibility of control and the role of interference in language-switching comprehension tasks. His study explores how recent and ongoing cross-language interference influences comprehension in complex listening contexts. In Talk 3, Andrea Philipp discusses how between-language conflict at the lemma-level shapes language control during switching. She examines the impact of cross-language interference on lexical selection and how conflict resolution processes facilitate language switching. Finally, in Talk 4, Maria Sanchez investigates sentence production in interactions with virtual interlocutors. Her study uses both voluntary and cued language-switching paradigms to examine how speakers adapt their language choice based on the interlocutor’s accent and linguistic background. Together, these talks showcase new directions in the study of bilingual language control, illustrating how innovative paradigms and technologies are reshaping our understanding of the cognitive mechanisms underlying language switching.

Keywords: Language control, language switching, bilingualism, cognitive flexibility, inhibition

Proactive control during bilingual comprehension: terms and conditions apply

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Bilingual language control is commonly described as the ability to manage cross-language interference. Whilst most traditional research has studied this process through reactive control, recent work has shown increased interest in a possible role for proactive control. In the current work, we investigated whether proactive control mechanisms can also be observed during language comprehension, where the need for language control is assumed to be smaller than in production. Across two experiments, Italian–English bilinguals performed a cued semantic categorization task in which cues were either informative or uninformative about the upcoming language. Experiment 1 employed arbitrarily colored cues, while Experiment 2 used more ecologically valid flag cues. Experiment 1 showed robust switch costs in the reaction times, indicating evidence for reactive strategies. However, Experiment 2 demonstrated an interaction between cue informativity and language transition: participants were more accurate on switch trials when preceded by an informative cue, suggesting a proactive benefit. On top of this, the same benefit was also present in the reaction times, but only when greater language control was needed (i.e., when participants needed to switch back to their L1). These findings provide novel evidence that proactive control can be engaged during bilingual comprehension, but its implementation is dependent on the strategic activation of language cues in the environment. We further argue that proactive control is costly and is recruited only when the benefits outweigh the expenditure, complementing reactive processes rather than replacing them.

Keywords: bilingualism, language control, language switching, proactive, reactive

Adaptive language control in bilingual speech comprehension: The influence of cross-language interference

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Comprehending speech in bilingual auditory environments requires attentional and language control processes to select the relevant language-specific information while resisting cross-language interference from competing linguistic input. The present study examined how recent and current cross-language interference influences bilingual speech comprehension. Thirty German-English bilinguals completed a language-cued selective listening task in which, in each trial, two spoken words were presented simultaneously, one in each language. Guided by visual cues, participants categorized the magnitude of the number word spoken in the target language as smaller or greater than five while ignoring the distractor in the non-cued language. Results showed worse performance when selectively listening to words in the second language. Additionally, language switch costs were observed when participants switched the target language across trials. These language switch costs were larger under higher levels of target-distractor cross-language interference, that is, when the magnitude category of the target word was incongruent with that of the distractor word. Incongruent trials also produced worse overall performance relative to congruent trials (i.e., congruency effect), indicating the processing of distractor information. Following incongruent trials, the congruency effect was reduced compared to post-congruent trials, showing a congruency sequence effect (CSE), but only when the target language repeated, reflecting adaptations of attentional control. However, following incongruent trials, language switch costs were greater, pointing to persisting effects of prior cross-language interference on language control. These findings indicate that attentional and language control processes flexibly adjust to changes in task demands, with performance costs modulated by both recent and current cross-language interference.

Keywords: bilingual speech comprehension, language control, language switch cost, congruency sequence effect, attentional control

Between-language conflict in language switching

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When bilinguals switch between their languages in language production, both languages are assumed to be activated in parallel. Thus, whenever bilinguals have to select a word in one specific language, this selection occurs in a situation of between-language interference. To allow selection nevertheless, between-language interference is presumably resolved by activating the target language and/or inhibiting the nontarget language (i.e., language control). In a series of language-switching experiments, we explored the role of between-language interference and language control on language switching. Between-language interference was manipulated by using a variable vs. constant item-to-language mapping. In a variable mapping, a picture was named in both languages throughout the experiment so that both languages can be assumed to be activated in parallel, leading to a high between-language interference. In contrast, in a constant item-to-language mapping a picture was named in one language only and thus (after some learning) should activate this language to a higher degree than the other language, resulting in a smaller between-language interference. Our results provide evidence that a constant item-to-language mapping (i.e., smaller between-language interference) reduced language-switch costs - which is the performance difference between language-switch and language repetition trials. Importantly, the switch-cost reduction did not only affect the current trial but also occurred in the subsequent trial, indicating aftereffects in terms of persisting language activation and/or inhibition. Taken together, our experiments demonstrate a critical role of between-language interference in language switching and suggest that language-switch cost can (to a large degree) be attributed to the resolution of between-language interference.

Keywords: Bilingualism, Language Switching, Language Production, Language Control, Inhibition, Interference

Language switching during sentence production

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For years, bilingual language control has been investigated under strictly controlled lab conditions, where bilinguals produce switches at the single word level following arbitrary cues (e.g., colours or sounds) in front of a computer screen. This line of research has built the basis upon which we can begin to understand language control in a clear and controlled manner. However, much of what makes language in spontaneous interaction is often left outside the lab for the sake of experimental control. The present talk addresses two studies on language control that gradually re-incorporate some of the noise from everyday language use into the experimental design. In a first study, we compared cued and voluntary switching in the context of sentence production using an action description task that allowed for increased syntactic and lexical variability in the participants' responses. In our second study, the action description task was completed in the context of an online game, in cued and voluntary switching conditions. French-English bilinguals had to adapt their language selection to fit the linguistic background of a series of animated interlocutors who spoke one or both of the participant's languages. Furthermore, we investigated the effect of the interlocutor's accent on the participant's performance. Our findings suggest that contextual factors modulate participants' reliance on bilingual language control. These results highlight the importance of studying language control in more linguistically and socially naturalistic environments.

Keywords: bilingualism, language control, sentence production, ecological validity, language switching

Visual Foraging Flexibility: Behaviour Across Space, Time, and Modality

Tuesday, March 17, 16:30 - 18:00, C-Building - N14

Chair(s): Jan Tünnermann¹, Iris Wiegand²

¹Charlotte Fresenius University of Psychology, Cologne, Germany

²Donders Institute for Brain, Cognition and Behaviour, Netherlands

In visual foraging, people search continuously for multiple targets across space and time. Perceptual, attentional, and decision-making processes act together to efficiently collect visual targets from dynamic environments. This symposium addresses how flexibly humans adapt their behaviour in these complex search tasks akin to many real-world search scenarios. Thornton and Kristjánsson will discuss the impact of grouping on “foraging for change” when searching in time-varying environments. Kristjánsson et al. investigate whether cross-modal synchrony cues influence foraging. Sauter and Tünnermann demonstrate how statistical learning guides the discovery of spatiotemporal hotspots in dynamic foraging tasks, highlighting sensitivity to environmental regularities. Hughes and Clarke present advances in modelling foraging behaviour to capture the dynamics of target selection. Finally, Wiegand shows that a foraging task with memory load can uncover both cognitive impairments, as well as compensatory strategies, in patients with Korsakoff syndrome and alcohol use disorder. Together, these contributions demonstrate how adaptive foraging behaviour emerges in response to the complex demands of dynamic, interactive environments.

Keywords: Visual Foraging, Visual Attention, Visual Search

The impact of grouping on foraging for change.

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It is well known that explicitly searching for change is extremely demanding and requires the serial deployment of attention, as demonstrated by studies of “change blindness” (Rensink, O’Reagan & Clark 1997). Here, we examined what happens when participants are asked to “forage” for change. We combined the classic change blindness flicker paradigm with the human foraging task introduced by Kristjánsson, Jóhannesson & Thornton (2014). Displays consisted of 96 items, each having one of two colors (blue or yellow) and one of two orientations (45° tilt left or right), arranged in a 12 x 8 grid. At display onset, there were 24 items of each color/orientation combination, randomly distributed within the grid. The novel aspect was a flicker cycle that consisted of a 300 ms stimulus presentation followed by a 300 ms blank. Twenty randomly selected targets either changed color (10 items) or orientation (10 items) during the blank interval. Participants were given the goal of collecting 200 targets during the whole session, irrespective of the type of change. They could refresh the display at any time, allowing us to explore patch leaving behaviour as well as the typical selection speed and run patterns. In the current talk we explore what happens to foraging behaviour when an additional spatial structure is added. We show that simply adding grid lines, to divide the display into a series of 2 x 2 “bushes”, greatly improved performance on all measures and we discuss the implications of such grouping benefits for foraging more generally.

Keywords: Human foraging, Change blindness, Flicker paradigm, Visual Search, Attention, Perceptual grouping

Effects of within- and across-modality synchrony on human foraging

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Can synchrony in stimulation guide attention and aid perceptual performance? We tested the influence of visual and auditory synchrony on attentional selection during a novel human foraging task involving multiple targets. We present results from a set of different tasks which all involve foraging for multiple targets on each trial. The visual stimuli ranged from lines changing color periodically to complex biological motion stimuli. We tested whether the synchronous change of targets (e.g. lines changing color from blue to yellow, or small dot rotating on a circle) aided foraging performance compared to when they changed asynchronously. We then also tested whether a non-spatial sound that occurred synchronously with the changes of the targets aided foraging performance (e.g. footstep sounds in synchrony with a point-light walker figure). The different experiments generally revealed benefits from visual synchrony, while the benefits from concurrent non-spatial sounds only occurred when participants directly foraged for the tempo of the changing stimuli. Our results demonstrate, across a number of tasks, that cross-modal cues to synchrony can be used to improve multitarget foraging, provided that synchrony itself is a defining feature of the target identity.

Keywords: Visual foraging, visual attention, crossmodal attention, auditory attention, tactile attention, synchrony

Catching Regularities: Statistical Learning of Spatiotemporal Hotspots in Dynamic Foraging

Marian Sauter & Jan Tünnermann

Marian Sauter^{1*}, Jan Tünnermann²

¹Ulm University, Experimental Psychology, Germany

²Charlotte Fresenius Hochschule, Germany

Adaptive behavior depends on the ability to detect and exploit regularities in the environment. Statistical learning has been shown to shape attentional priority maps in static tasks, but its contribution to active exploration of dynamic environments remains understudied. This study examines how humans learn and adapt to probabilistic structure in a dynamic foraging task. In interactive displays with moving targets and distractors, participants collected conjunction-defined targets that followed biased trajectories. Experiment 1 revealed emergent spatial biases toward high-probability target regions; Experiment 2 demonstrated flexible reweighting after contingency shifts; Experiment 3 (ongoing) tests continuous adaptation to a moving hotspot. The findings advance theories of selection history and predictive control, with statistical learning as a mechanism for adaptive exploration in dynamic environments.

Keywords: statistical learning, visual foraging, dynamic environments, spatiotemporal hotspots

Modelling search order and patch leaving decisions in visual foraging

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Many recent visual foraging studies have focused on the cognitive processing while participants select targets within a patch: for instance, they have focused on how the perceived value of targets affects selection decisions, or how people make choices between sticking with the same target type or switching to another. We have built a generative Bayesian model (FoMo) that can make relatively accurate target-by-target predictions during foraging tasks. However, a separate strand of foraging research has focused on the question of when people terminate their search in a given area to move onto a new foraging patch. Here, we use a difficult foraging paradigm where participants collect “L-shaped” targets among Ts in either exhaustive blocks (where they must find all ten targets on each trial) or inexhaustive blocks (where they can move on at any point during a given trial but must collect a certain number of targets in total in the block). We then use the results from this paradigm to extend FoMo to allow it to make patch-leaving predictions. We compare our results to other approaches to understanding patch-leaving behaviour (such as Marginal Value Theorem) and discuss how our methods can help to bring together previously disparate parts of the visual foraging literature.

Keywords: visual foraging, marginal value theorem, visual search, computational modelling

Hybrid foraging reveals cognitive deficits and compensatory behaviour in patients with Korsakoff syndrome and alcohol use disorder

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Korsakoff's syndrome (KS), a chronic disorder due to thiamine deficiency commonly associated with alcohol use disorder (AUD), is characterized by amnesia as well as visuospatial deficits. In this study, we tested how these cognitive impairments interact during complex, realistic search tasks using a hybrid visual-and-memory foraging task.

KS patients, AUD patients without cognitive impairment, and healthy controls (HC) first memorized either 2 or 8 target objects. Subsequently, they “collected” multiple instances of these targets, presented among distractors, across multiple displays (“patches”). Collected targets disappeared from patches, making the task progressively more challenging when continuing to search within a patch. Participants could freely decide when to leave a current patch to explore a new one. The goal was to maximize target collections over time.

Our results demonstrated a gradual decline in search speed from HC to AUD to KS. Furthermore, patients with KS showed higher costs of increasing distractor and memory load than both AUD patients and HC. Under high memory load, both KS and AUD searched in “runs” of specific target types, thereby avoiding switch costs. Finally, all groups made near-optimal patch-leaving decisions (maximizing collections per unit time), although KS and AUD patients missed more targets under high memory load.

These findings highlight the interplay of episodic memory deficits, selective attention impairments, and decision-making during complex, realistic search tasks. While search speed and efficiency are reduced in patients with KS—and even in AUD—compared to HC, they nonetheless adapt their search strategies.

Keywords: visual search, foraging, exploration - exploitation trade-off, korsakoff syndrome, alcohol use disorder, memory disorder

Sharing the Load: Exploring the Mechanisms That Support Distributed Cognition

Wednesday, March 18, 09:00 - 10:30, HSZ - N1

Chair(s): Miles Tufft¹

¹University College London, United Kingdom

Hutchins (1995) describes the scenario of crew members working together to navigate a ship at sea. They act as a well-coordinated team, with each crew member fulfilling a distinct role. The helmsperson steers the ship, the lookout scans for hazards, the compass operator checks bearings. By smoothly distributing task-relevant information, the team collectively solves complex problems that surpass the capacity of any single individual. What are the cognitive mechanisms that underpin such distributed behaviours? Our symposium aims to shed light on this question by drawing upon research from a range of cognitive domains. Across five talks, we discuss mechanisms that support individuals in distributing cognitive labour to solve complex tasks collectively. We cover tasks such as searching, remembering, problem-solving and decision-making. In doing so, we hope to demonstrate how our cognitive processes are attuned to the social world around us in ways that enable people to distribute, share, or offload cognitive load and thereby achieve more together than they could alone.

Keywords: distributed cognition, social contexts, joint tasks

How t(w)o divide a search task

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When looking for a certain object or person, individuals often engage in collaborative visual search, i.e., they search together by coordinating their behavior. For instance, when parents are looking for their child on a busy playground, they might search collaboratively by dividing the search area. This type of labor division in collaborative visual search could be beneficial not only in daily life, but also in professional life (e.g., at airport security screening, lifeguarding, or diagnostic radiology). To better understand the mechanisms underlying this type of collaborative behavior, as well as its benefits and costs, researchers have studied visual search scenarios in the laboratory. The aim of this talk is to provide a brief overview of the results of these studies. Are individuals faster if they search together compared to alone? And if so, should they simply search in parallel, or will they benefit from agreeing on a specific labor division? How should they divide the search space, and how to communicate this division? Should a consensus be reached (target present or absent?) before ending the search? We address these and further key questions, focusing on the aspect of labor division. We hope that this talk can serve not only as a theoretical foundation for basic research but also as a practical inspiration for applied research and development.

Keywords: joint action, division of labor, social cognition, distributed cognition, visual search, collaboration

Your eyes have it: Can dividing the labour reverse the gaze cuing effect?

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Over the past two decades, research has increasingly highlighted how social contexts shape cognition. Behaviours and their associated mechanisms do not operate in isolation but within socially rich environments. An important example is gaze-driven orienting of attention. Observers have been shown to reliably respond faster to targets at gazed-at locations, and the magnitude of this cuing effect often varies with the social attributes of the gazer (e.g., higher status leads to larger cuing effects). These findings position gaze as an adaptive signal for where to look, one that is sensitive to social structure in the world.

We extend this work by asking whether gaze can also act as a cue for where not to look. In collaborative search, for instance, it may be advantageous to orient toward non-gazed-at locations in support of a division of labour. Using an online version of Friesen and Kingstone's (1998) spatial gaze-cuing paradigm, we first replicated the classic effect. We then introduced a joint task manipulation in which participants believed that the schematic face's gaze shifts reflected real eye movements from a co-acting partner. This social belief increased the cuing effect, demonstrating how even minimal social contexts can modulate attentional orienting. Finally, we attempted to reverse this effect by embedding the task within a collaborative search scenario in which participants learned that their partner consistently monitored one side of the visual field. We present preliminary evidence from this study and interpret the results in terms of attentional mechanisms that may support distributed forms of cognition.

Keywords: Visual Attention, Joint Tasks, Social Context, Gaze Cuing, Division of Labour

How can we counteract the build-up of knowledge illusions in distributed problem solving?

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Problem solvers who routinely distribute cognitive processing between their minds and the external environment often overestimate their ability to perform tasks without outside help. This bias—commonly referred to as knowledge illusion, illusion of competence, or foresight bias—has been demonstrated in multiple contexts such as anagram solving, where participants who had received the solution’s first letters (e.g., “C O O _ _ _” for “OEOCKI”, solution: COOKIE) for a while led them to overestimate their future performance without outside help (e.g., “_ _ _ _ _ _” for “F E O E F C”, solution: COFFEE). Metacognitive miscalibrations are problematic, as they can shape decision-making and foster unwarranted reliance on one’s own abilities when seeking support would be advantageous or even critical. In this talk, we will review established and introduce novel interventions to recalibrate or prevent the development of knowledge illusions. Specifically, we will present novel work regarding an intervention involving five questions designed to reflect on the contribution of outside help (e.g., “How confident are you that you could have solved the anagrams without any hints?”). In addition, we will describe an intervention in which the outside help was provided by agents with either software-like or robot-like appearances, which was aimed at enhancing the distinction between internal and external contributions to problem solving and thereby mitigating the emergence of knowledge illusions.

Keywords: Extended cognition, cognitive offloading, distributed cognition, illusions of competence, knowledge illusion, metacognition

Speaking to offload memory to a partner overcomes the production effect

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We often ask others to help us remember information, but how does speaking to others for this purpose influence memory? Transactive memory theory predicts that when partners share a memory task, exchanging information while learning allows them to divide the memory load, such that each person can forget the partner's share of the information. Yet, producing information (e.g., speaking) is known to improve memory compared to perceiving it (the production effect). We examined whether speaking to offload memory to a partner in a shared memory task enables offloading, and thus overrides the production effect. In two experiments (Exp. 1 $N = 45$, Exp. 2 $N = 43$), participants studied words by reading them out loud or silently. In one condition participants studied alone, and in the other they studied with a confederate (Exp. 1) or participant (Exp. 2) partner who took responsibility for remembering the words the participant spoke out loud. Recognition (Exp. 1 and 2) and recall (Exp. 2) tests, always performed alone, followed each study condition. Speaking to a partner in order to offload both reduced and reversed the production effect. After speaking alone, participants showed the typical recall and recognition advantage for spoken words compared to non-spoken (silent) words (production effect). After speaking to offload, participants recalled substantially fewer spoken words compared to silent words, and they showed no recognition advantage for spoken words. These effects were more pronounced for those who rated the partner as helpful or reliable. These findings suggest that speaking can enable memory offloading in shared-memory contexts.

Keywords: social offloading, production effect, speaking, transactive memory, voluntary forgetting

From Context to Cognition: Factors Shaping Evaluative Conditioning

Wednesday, March 18, 09:00 - 10:30, HSZ - N2

Chair(s): Claudine Pulm¹, Florian Weber²

¹University of Cologne

²Ruhr University Bochum

Evaluative Conditioning (EC) refers to changes in attitude towards a conditioned stimulus (CS) due to its pairing with a positive or negative unconditioned stimulus (US). In this symposium, we discuss various context-related and cognitive factors that may influence EC effects and shape the resulting conditioned attitudes. The first talk will explore whether letting participants rate a CS both before and after conditioning - rather than only afterward - impacts EC effects. The second talk centers around valence asymmetries resulting from differences in the frequency of positive and negative USs during EC. Whereas prior research has focused on valence asymmetries for individual stimuli, this talk extends the analysis to groups, demonstrating that rare group members can disproportionately affect overall group evaluations. Focusing on instances of EC with multiple, simultaneously appearing USs, the third talk presents evidence that adding weakly positive (negative) USs to a highly positive (negative) US diminishes EC effects. The fourth talk investigates the role of language for the conditioning process, testing whether a native vs. a secondary language context during EC leads to different outcomes. The last talk examines autonomous sampling during EC, asking whether merely instructing participants to sample certain stimuli more frequently is sufficient to achieve the effect that autonomous sampling has on conditioned attitudes. In summary, these talks offer valuable insights into how contextual and cognitive processes shape EC effects, enhancing our understanding of EC and highlighting promising directions for future research.

Keywords: Evaluative Conditioning, Attitude Change, Learning, Memory, Evaluations

Pre-Ratings of Conditioned Stimuli as a Potential Source of Bias in Evaluative Conditioning

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Evaluative conditioning (EC) research deals with the question of how we form attitudes toward conditioned stimuli (CSs) by pairing them with positive or negative unconditioned stimuli. In the present study ($N = 296$), we experimentally investigated whether measuring the attitude toward the CSs before conditioning influences the EC effect. We reasoned that assessing participants' attitudes before conditioning might signal the importance of this judgment (e.g., through conversational norms/experimental demands) and thereby bias subsequent evaluations. Participants either rated their liking of the CSs both before and after conditioning or only after conditioning. Results showed an EC effect and, more importantly, that the magnitude of the EC effect did not differ between groups. These findings suggest that pre-ratings of CSs do not systematically inflate or deflate conditioned attitudes in EC paradigms.

Keywords: Evaluative Conditioning, Attitude Learning, Conversational Norms, Experimental Demands, Attitude Measurement

Valence Asymmetries in Group Evaluations: Rare Members Shape Group Impressions

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Evaluative Conditioning (EC) describes changes in liking that occur when a conditioned stimulus (CS) is paired with an unconditioned stimulus (US). Sperlich and Unkelbach (2024) showed that EC studies generally do not exhibit a negativity bias, such that negative information (e.g., images of aggressive animals) does not typically have a stronger impact than positive information (e.g., images of cute animals) on CS (e.g., geometric shapes) ratings. They offered a cognitive-ecological explanation for this pattern: because positive and negative USs (e.g., cute or aggressive animals) are usually presented with equal frequency in EC paradigms, no bias emerges. However, when positive and negative USs differ in frequency, valence asymmetries arise. In particular, rare negative USs produce a negativity bias (i.e., more negative ratings of CSs paired with rare negative USs than with frequent negative USs), whereas rare positive information leads to a positivity bias (i.e., more positive ratings of CSs paired with rare positive USs than with frequent positive USs).

The present research examines whether these valence asymmetries, previously observed for individual stimuli, also extend to groups. Across four pre-registered online experiments ($N = 2,404$), we tested whether rare group members (aliens or soccer players; CSs) paired with negative or positive animal pictures (USs) influence evaluations of other paired (Study 2) or non-paired group members (Study 1, 3, and 4). Across all experiments, the results consistently show that individual group members exert a disproportionate influence on evaluations of the group as a whole. In other words, rare stimuli exert an influence on group evaluations comparable to that of frequent stimuli.

Keywords: evaluative conditioning, valence asymmetries, information ecology, attitudes, group evaluations

Less is more - Dilution effects in evaluative conditioning with multiple unconditioned stimuli

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Research on Evaluative Conditioning (EC), that is, changing attitudes towards a Conditioned Stimulus (CS) by pairing it with a positive or negative Unconditioned Stimulus (US), has recently begun investigating stimulus-rich contexts with multiple USs appearing simultaneously. Evidence suggests that in these situations, conditioned attitudes follow the average valence of the simultaneously paired USs. One crucial yet unexplored consequence of this averaging pattern is the occurrence of a dilution effect: adding less positive (negative) USs to a situation with a highly positive (negative) US should diminish attitudes towards the paired CS, despite the less positive (negative) USs on their own being able to influence CS attitudes. To investigate this consequence, we conducted three experiments ($N = 1100$) in which CSs appeared with different combinations of USs with varying positive (negative) valence levels. Overall, the results confirm the averaging pattern observed in previous studies, which indeed led to a dilution effect in our EC paradigm: CSs simultaneously paired with a highly positive (negative) US and less positive (negative) USs were rated less positive (negative) compared to CSs that exclusively appeared with a highly positive US. The results suggest that when changing attitudes via EC in stimulus-rich contexts, US valence is more important than US quantity.

Keywords: evaluative conditioning, attitudes, dilution effect, information integration, evaluation

Greater Control Over Evaluative Conditioning Effects in One's Native Language

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This study investigates how language context (native vs. secondary) affects controlled and uncontrolled Evaluative Conditioning (EC) processes, highlighting differences in the controllability of evaluative influences. Given English's global dominance in advertising, understanding these mechanisms in non-native speakers is crucial for explaining their susceptibility to emotionally charged marketing influences.

A process dissociation procedure (Hütter & Sweldens, 2018) was used to disentangle controlled and uncontrolled evaluative influences. Participants (native Dutch speakers; $N = 230$, $M_{age} = 19$) evaluated abstract logos paired with pretested positive or negative words presented either in their native or secondary language (between subjects). They were instructed to align or reverse their evaluations in two within-subject phases (standard and reversal). A multinomial processing tree (MPT) model estimated three parameters: controlled effects (c), reflecting evaluations consistent with the instructions; uncontrolled effects (u), reflecting assimilative evaluations consistent with paired valence regardless of instructions; and general response biases (r), reflecting a uniform tendency toward all logos, independent of valence or instructions.

Model results showed good overall fit ($G^2(2) = 0.18$, $p = .913$). The c -parameter was significantly higher in Dutch ($c = .68$) than in English ($c = .57$), $\Delta G^2(1) = 27.24$, $p < .001$. No differences emerged for the u -parameter (0.41 - 0.43), $\Delta G^2(1) = 0.21$, $p = .645$, or the r -parameter, (0.51 - 0.52), $\Delta G^2(1) = 0.01$, $p = .904$.

These findings suggest better control over EC influences in one's native language, while uncontrolled influences occur equally across languages. Language thus emerges as a key factor in the controllability of EC effects.

Keywords: Evaluative Conditioning, Controllability, Language, Native versus secondary language, Process Dissociation Procedure, Consumer vulnerability, Advertising influences

Interpreting one's choices: Instruction-based autonomous sampling in evaluative learning

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People play an active role in much of their everyday learning, making sampling decisions about the stimuli they choose to learn about. Recent work incorporating genuine autonomy into an evaluative conditioning paradigm demonstrated that these sampling decisions not only shape the information available, but also provide evaluative information themselves: Sampling a stimulus more often predicts increased liking of the stimulus, regardless of whether it is consistently paired with positive or negative images. The current experiments employed an instruction-based version of the paradigm, asking participants to imagine that they chose to interact a variable number of times with stimuli that were consistently paired with positive or negative images. Mirroring the effects in the original paradigm, we found that the effect of (imagined) paired valence replicated in this version of the paradigm, such that stimuli stated to have been paired with positive versus negative images were evaluated more positively. In contrast, we did not find a similar effect of sampling frequency on evaluations. That is, people did not reliably exhibit positive shifts in evaluations for those stimuli they were asked to imagine choosing more frequently. Nevertheless, follow-up analyses revealed that people recalled a higher number of interactions for those stimuli they showed a more positive evaluative shift toward. Together, these results suggests that while people tend to infer a connection between their attitude toward a stimulus and how frequently they chose to interact with it, genuine autonomy in those decisions plays a crucial role in their positive impact on evaluation.

Keywords: evaluative conditioning; sampling; autonomy; attitudes

Part I: Linguistic and Non-Linguistic Cognition - Comparative and Developmental Perspectives

Wednesday, March 18, 09:00 - 10:30, HSZ - N3

Chair(s): Barbara Kaup¹, David Dignath¹

¹University of Tübingen, Germany

This symposium examines the interplay between linguistic and non-linguistic cognition. While some cognitive functions appear to depend on language, others seem rather independent of it and many more integrate both aspects. In psychology, however, the distinction between linguistic and non-linguistic cognition is rarely made explicitly and there is currently no consensus on how language may shape, enable or constrain thought.

The symposium brings together perspectives from cognitive research, developmental psychology and animal cognition to address three questions: (1) How are language and thought related? (2) Which cognitive functions are inherently linguistic, and which are not? (3) To what extent can language modulate domains traditionally considered non-linguistic? Part II brings together comparative and ontogenetic perspectives, focusing on animal cognition and human development. Lena Veit will speak about vocal communication in birds. Marlen Fröhlich's contribution deals with pragmatic inference abilities in orangutans. Paul Gallenkemper studies expectation formation in conceptual and non-conceptual contexts. Krisztina Orban looks at pointing in human and non-human primates as well as from a development perspective, concluding that pointing is a proto-linguistic behavior bridging the gap between non-linguistic behavior and fully developed language. Claudio Tennie discusses the hypothesis that human culture requires language and language in turn requires know-how copying abilities, that are nearly or completely absent in non-human apes. Part II adopts a cognitive psychology perspective (see detailed description there).

Keywords: comparative psychology, culture, pragmatic inferences, developmental psychology, pointing, episodic memory, thinking and language

Syllable sequencing in birdsong

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Many complex behaviors such as speech, dance or writing are composed of ordered sequences of simpler motor elements, and the flexible control of sequential behavior has broad implications for cognition and motor function. My research group studies birdsong as a model for vocal learning and skilled motor production, which relies on a specialized circuit of brain nuclei. Bengalese finch (*Lonchura striata domestica*) song is composed of acoustically distinct syllable types, which appear in variable order following syntactic rules. I will present recent work probing the mechanisms of syllable sequencing in Bengalese finches with behavioral experiments and neurophysiology.

Keywords: bird song, sequential behavior, vocal learning

Pragmatic Inference Without Words? Evaluating RSA in Great Ape Communication

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Studies of meaning in human and primate communication face, in principle, similar methodological challenges. In both cases, meaning is not directly observable but must be inferred from indirect sources, such as observable behaviour. Recent work building on the Rational Speech Act (RSA) framework has developed methods for inferring latent semantic meaning through probabilistic models of language use. Here, we explore how such an approach can be adapted for the study of primate communication. To this end, we developed a bespoke probabilistic model of the processes that generate communicative behaviour, using functionally specified latent meaning representations. As a proof of concept, we applied this novel Lexical Association Model (LAM) to a richly annotated dataset of dyadic communicative interactions (>8,000 communicative acts) observed in wild and captive orangutans (*Pongo abelii* and *P. pygmaeus*). Specifically, we inferred the latent meaning of gestures by integrating observations of the signal (the gesture itself), the state (the presumed social goal), and the recipient's response (the outcome). Our preliminary results indicate that latent signal meanings vary with social relationship (e.g., mother-offspring vs. others) and research setting (wild vs. captive). A critical next step will be to extend this model to multimodal communication, including vocalisations and facial expressions. We conclude that explicit probabilistic modelling can provide valuable insights into animal communication, particularly regarding the context-dependent nature of signals and the gradual evolution of human communication systems.

Keywords: primate communication, gesture, evolution of language, pragmatics, context sensitivity, probabilistic modeling

Expectation Building and Violation in Infancy: Insights from Eyetracking and Pupillometry in Categorical and Non-Categorical Contexts

Paul Gallenkemper^{1*}, Nina-Alisa Kollakowski¹, Ulf Liszkowski¹

¹University of Hamburg, Germany

Infants build expectations about repeated stimuli and show signs of surprise when their expectations are violated. This talk presents evidence from two studies investigating infants' pupil dilation responses (PDR) during expectation violation in categorical versus non-categorical learning contexts. PDR to deviating trials should be related to the conceptual (or spatial) distance to the expectation. In Study 1 ($N = 45$, age = 14 months), infants learned about either individual objects or object categories—a form of learning linked to early language development. During test trials, infants viewed novel objects that were either from the same or a different category. PDRs revealed that infants showed stronger dilation to different-category test events than to standard control events, but not to same-category test events, and only after category learning—not after object learning—indicating category-based expectations and surprise (cluster-mass $t = 902.90$, Monte Carlo $p = .004$). In Study 2, infants repeatedly saw a stimulus appear at a location before it reappeared at the same, a deviating 90° , or 180° location. In the first two Experiments ($N = 53$ and $N = 50$), infants did not show significant PDR differences across test locations. In an additional Experiment investigating the categorical counterpart, infants learned about distributions of locations (data collection is ongoing, $N \approx 48$). Together, these studies suggest that infants' surprise responses—indexed by pupil dilation—depend on the type of regularity learned. Implications for different expectation violation dynamics between categorical and non-categorical contexts in infancy will be discussed.

Keywords: Pupillometry, Eyetracking, Category Formation, Statistical Learning, Developmental Psychology

Pointing as Proto-Linguistic Behaviour

Krisztina Orbán^{1*}

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This talk explores the idea that pointing is a proto-linguistic communicative act, bridging the gap between non-linguistic behavior and fully developed language. Building on work by Tomasello (2010), Planer and Sterelny (2021), and others, it argues that pointing is not merely a precursor to language but a fundamental tool with symbolic, indicative, and iconic properties. Evidence from infant development, sign languages, and homesign systems shows that pointing carries illocutionary force, supports referential communication, and functions similarly to linguistic demonstratives. Human pointing differs fundamentally from that of non-human primates, requiring more advanced cognitive and social capacities. The talk analyzes distinctions between showing, begging, and pointing, arguing that pointing is referring and reference-fixing. Importantly, pointing is used not only for communication but also for thinking—for example, as a tool for counting, organizing information, or aiding memory. Its symbolic and arbitrary nature, combined with universal interpretability and ease of production, makes it a uniquely human behavior. Pointing likely evolved to meet the need for flexible referring to a wide range of objects, supporting infinite expressibility in terms of referring (yet semantic recursion). We argue that pointing allows some compositionality, but not like language. Pointing has some essential features of language but less developed than in language. Ultimately, pointing exemplifies the transition from perceptually driven indicators to intentional communication and cognition, positioning it as a proto-linguistic behavior foundational to language evolution. Pointing likely evolved as a hybrid with primitive sound production which allows the transition to language.

Keywords: pointing, referring, intentionality, gesture proto-linguistic behavior, language evolution

Language Needs Know-How Copying and Human Culture Needs Language

Claudio Tennie^{1*}

¹Tools and Culture among Early Hominins Research Group, University of Tübingen, Germany

Human culture exhibits a ratchet effect: faithful copying of “know-how” lifts each generation beyond individual invention; beyond a biological baseline. I argue, first, that language itself depends on powerful copying of know-how (e.g. how words sound like). Second, once present, language massively scales cultural evolution across technology, science, arts, norms, and institutions. Crucially, culture is not only an outcome of human minds but also a producer of human minds: beyond Vygotskian “cultural intelligence,” we culturally acquire “cultural minds” whose capacities are shaped by and via culturally accumulated know-how. For many complex cultural outcomes X (e.g., modern computers), language is plausibly a necessary enabling condition. By logical necessity, if X requires language, then X requires also the prerequisites of language. As one such core prerequisite is the ability to copy know-how, such outcomes X require such copying, too. The archaeological record is consistent with a late (multi-factorial) evolution of this kind of copying (within the last 1 million years). Supporting this view, non-human apes show no robust evidence of copying know-how beyond baseline reach, aligning with their limited cumulative culture, their limited cultural intelligence and their limited cultural minds.

Keywords: social learning, culture, language, cultural intelligence, Vygotsky

Neuro-Cognitive Advances in Visual Word Recognition Research

Wednesday, March 18, 09:00 - 10:30, HSZ - N4

Chair(s): Benjamin Gagl¹

¹Universität zu Köln, Germany

Visual word recognition and reading are central to human communication. Still, literacy rates are declining, increasing the need for better reading education and interventions for readers with low skill levels. At the beginning of such developments, one must understand the cognitions underlying reading. Here, we combine presentations that provide current developments in reading research, investigating how language, script, and memory influence visual word recognition processes in behavior and brain activation. We will start with a study by Sabrina Turker, which investigates the influence of language and memory skills on reading disabilities. The second study, by Benjamin Gagl, examines the influence of which items are stored in the lexicon on orthographic processing in visual word recognition behavior and brain responses. The third study, by Amelie Hague, investigates script familiarity on brain response dynamics. The fourth study, by Maz Mohamed, analyzes how learning to read in different languages influences the process of lexical access. Finally, Jana Hasenäcker presents a large-scale study of German lexicon decision data, which is essential to exploring novel hypotheses built on consensus-based guidelines, embracing open science methodology. The symposium relies on behavioral and brain findings across studies using implemented theoretical approaches through computational models, and offers an overview of the availability of novel datasets. Thus, this symposium delivers a comprehensive update on the neuro-cognitive processes implemented in reading and visual word recognition, including current theoretical advancements.

Keywords: Reading, Visual word recognition, Dyslexia, Brain activation, Computational models, Open Science

The influence of knowledge on perception: Model-based study of how lexical knowledge optimizes visual word representations

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When we read, our brain extracts meaning from words, but the extent to which our lexical knowledge aids this process is unclear. Here, we utilize a transparent computational model that simulates human orthographic behavior to examine the influence of word knowledge on orthographic processing. The model incorporates pixel, letter, and letter-sequence representations based on the neuronally plausible predictive coding assumption, offering a framework for investigating the integration of sensory input with knowledge (i.e., as a top-down prediction). Here, we test different lexicon structures from which the model derives the top-down predictions. For model evaluation, we use a pseudoword learning dataset that allowed us to know which items participants learned. We compare three lexicon assumptions: (i) including only learned items, (ii) all words that participants should have learned, and (iii) a lexicon only including the foils. We analyzed response times and errors and found the highest model fit for the representations that integrated the lexicon with only the learned words, including all three representations. Thus, with this model-based approach, we find substantial support for a direct link between lexical knowledge and downstream orthographic processing, indicating that representations of visual words are optimized based on our lexical knowledge to implement efficient reading.

Keywords: Visual word recognition, lexical knowledge, orthographic processing, lexical decision, word learning

Behavioural manifestations of dyslexia: from phonological awareness to working memory and speech production

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Dyslexia is typically defined by difficulties in accurate and fluent word recognition, yet behavioural evidence suggests that these challenges extend across multiple linguistic and cognitive domains. Across several studies, we investigated how phonological awareness, verbal working memory, and speech production interact in shaping the behavioural profile of dyslexia. Children with dyslexia performed poorly on various language learning and working memory tasks, with major deficits in non-word span, phonetic memory and vocabulary learning. Especially children with additional attention deficits showed more severe working memory deficits and weaknesses in non-language domains. Follow-up research identified spelling, word reading, and phonological awareness as the strongest predictors of dyslexia in adults, alongside a markedly heterogeneous behavioural profile - even low-level deficits persisted into adulthood despite the shallow nature of the German orthographic system. Our most recent findings extend this framework to speech production: acoustic analyses show subtle but systematic differences in articulatory variability between adults with and without dyslexia. Specifically, individuals with dyslexia exhibited less distinct voicing contrasts and slightly reduced category compactness, suggesting persistent imprecision in phonetic implementation.

Keywords: dyslexia, working memory, cognition, reading, speech production, spelling

Brain response dynamics during the early processing of novel script as compared to familiar script

Amelie Haugg^{1*}, Nada Frei¹, Silvia Brem¹

¹University of Zurich, Switzerland

Introduction: When we learn how to read, an extensive, specialized reading network is established in the brain. Yet, the neural dynamics that support the earliest stages of reading remain poorly understood. Here, we combined a brief artificial script reading training with fMRI time-course analyses to characterize how adults process a newly learned script relative to a familiar script during a lexical decision task.

Methods: 61 typically reading adults completed tests on working memory, attention, and reading fluency, and trained 12 associations of artificial script letters and German speech sounds. After training, participants performed a lexical decision task with words and pseudowords written in either artificial script or Latin script during fMRI. Finally, an artificial script reading fluency task was performed.

Results: Compared to Latin script reading fluency, artificial script reading fluency showed stronger correlations with attention ($r(60)=0.56$, $p < 0.001$; difference: $z(60)=1.90$, $p = 0.03$) and working memory ($r(60)=0.38$, $p = 0.003$; difference: $z(60)=1.63$, $p = 0.05$). During the lexical decision task, artificial script reading elicited greater activation within the multiple-demand network than Latin script reading. Further, time course analyses revealed substantial differences in peak latencies between key regions of the brain's reading network and demonstrated a link between artificial script reading fluency and peak activation within the Visual Word Form Area, Precentral Gyrus, and Inferior Parietal Lobule.

Discussion: Our findings demonstrate the value of fMRI time-course analyses when investigating reading processes in the brain and indicate that domain-general processes (i.e., attention and working memory) rapidly scaffold early reading in the brain.

Keywords: reading, artificial script, neuroimaging, functional Magnetic Resonance Imaging, lexical processing, lexical decision task

Lexical processing in English, Dutch, Estonian, and Malay: pros and cons of combined n-grams of different sizes in the Discriminative Lexicon Model

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The Discriminative Lexicon Model (DLM) works with linear or deep mappings from form embeddings to meaning embeddings. One simple way of designing form embeddings is to construct multiple-hot binary vectors that specify which n-grams (for fixed n, e.g., bigrams or trigrams) are present in a words orthographic or phonological representation. We report on explorations of combining n-grams for multiple n (e.g., form vectors specifying the presence of both bigrams, trigrams, and 4-grams), for four different languages, with special attention to trade-offs between gram sizes, the use of linear versus deep mappings, and language. Deep mappings offer higher prediction accuracy, but linear mappings tend to be more precise for predicting response latencies. Linear mappings with multiple-sized n-grams also show a clear advantage compared to models with only 3-grams, and tend to outperform models with deep mappings. The option of working with multiple n-grams will become available in the Julia package JudiLing, which provides a computational implementation of the DLM.

Keywords: computational modeling, lexical processing, reaction times, linear mappings, deep mappings, n-grams, form embeddings

The TRUST Guidelines for Psycholinguistic Reading Studies and the German Lexicon Project

Jana Hasenäcker^{1*}, Benjamin Gagl², Xenia Schmalz³, Jack Taylor⁴, Aliona Petrenco⁵, Louis Schiekiera⁵, Tanja C. Roembke⁶

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⁶RWTH Aachen University, Germany

Reading research increasingly requires large-scale, high-quality data to test and refine models of visual word recognition. The TRUST network aims to provide a transparent, transferable, and sustainable foundation for psycholinguistic reading studies in German by developing consensus-based guidelines for best practices in lexical decision experiments.

Based on these guidelines, the German Lexicon Project (GLP) was launched to coordinate large-scale, multi-lab data collection across more than a dozen research sites across the German-speaking regions of Europe, including Austria, Switzerland, and South Tyrol. When complete, the resulting open dataset will contain behavioral data from over a thousand participants, providing a robust resource to address fundamental questions about lexical, orthographic, and semantic processing in German.

Both the TRUST guidelines and the GLP bring together researchers in the field of visual word recognition, creating new and shared resources for reading research, and exemplifying how consensus-driven collaboration can advance reproducibility, comparability, and transparency. In this talk, we will present the guidelines, preliminary findings from the GLP, and how these resources can be used by researchers interested in German words.

Keywords: visual word recognition, lexical decision, reading research

When and Why Instruction Works: Mechanisms and Boundary Conditions of Interventions in the Science of Learning

Wednesday, March 18, 09:00 - 10:30, HSZ - N5

Chair(s): Bernhard Pastötter¹, Tanja C Roembke²

¹Trier University, Germany

²RWTH Aachen University, Germany

This symposium surveys diverse instructional learning approaches and their boundary conditions across tasks, materials, and learner groups. Five talks address the benefits of production, interleaving, pretesting, backward testing (retrieval practice), and forward testing for learning, retention, and transfer, with an emphasis on examining and discussing the cognitive mechanisms of these effects. Tanja Roembke will talk about the production effect, which describes better memory for items spoken aloud than read silently. The presented research investigates to what extent semantic spreading activation contributes to the production effect. David Shanks will talk about the interleaving effect and improved inductive learning when exemplars are mixed rather than blocked. The talk will analyze why learners (children and adults) often misjudge blocking as superior and will describe an intervention that reverses this metacognitive illusion, leading to more advantageous scheduling choices. Oliver Kliegl will talk about the pretesting effect, which describes improved long-term retention when learners attempt answers before study, even when initial guesses are incorrect. The talk will demonstrate that the magnitude of this benefit increases with the number of guesses, with generalization across weakly related word pairs, prose passages, and age groups. Simone Malejka will talk about the (backward) testing effect, which describes superior long-term retention after retrieval practice compared to restudy. She will compare restudy and free-recall practice and use cognitive modeling to separate maintenance from retrieval contributions, specifying conditions under which retrieval practice yields the largest benefits. Bernhard Pastötter will talk about the forward testing effect, which describes enhanced learning of new material following interim tests on earlier material. He examines how divided attention affects forward-testing benefits for word lists and text passages, delineating boundary conditions under which interim tests enhance subsequent learning. Collectively, the symposium addresses five central instructional learning techniques and distills both theoretical (mechanistic) conclusions and practical implications for real-world learning and instruction.

Keywords: episodic memory, testing effects, interleaving effect, production effect, instruction

The Role of Semantic Encoding in Production-Enhanced Memory

Tanja C. Roembke^{1*}, Rachel M. Brown¹

¹RWTH Aachen University, Germany

Words that are read aloud are recognized and recalled more accurately than words that are read silently (the production effect). The production effect is a robust memory phenomenon that has been found with a range of materials and manipulations, but questions remain about the role of different linguistic representations engaged by speaking. A recent study reports that the production effect was reduced but not eliminated when semantic recognition was disrupted, suggesting a role of semantic encoding in the production effect. In line with this, we hypothesize that production increases spreading activation from proximate orthographic and phonological representations to more remote semantic ones. If production enhances semantic encoding in this way, it should not only be reduced when semantic recognition is disrupted, but it should also persist when semantic recognition is favored. In a registered report, we test this prediction in two within-subject experiments (planned $N/\text{experiment} = 76$). During encoding, German-English bilinguals read German words aloud or silently. At recognition, item presentation is manipulated: Both experiments include a veridical condition, where items are German words as before. Additionally, items are presented as pictures (Experiment 1) or translations (Experiment 2). A preliminary data analysis from Experiment 1 ($N = 50$) shows a production effect in both testing conditions and lower performance in the picture than veridical condition, but no interaction of production effect by testing condition. These findings suggest that production may influence semantic encoding of written words, even if those associations are indirect (i.e., mediated by other, stronger associations).

Keywords: Production effect, memory, spreading activation, language, bilingualism, reading

The interleaving effect: Understanding and reversing a metacognitive illusion.

David Shanks^{1*}, Anran Li², Muzi Xu², Chunliang Yang²

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²Faculty of Psychology, Beijing Normal University, China

Interleaving exemplars leads to far better inductive learning than blocking them. This research aims to shed light on why learners (both adults and children) hold the misconception that blocking is a more effective strategy than interleaving. In children, this metacognitive bias intensifies with age, leading older children to be less willing to use interleaving during self-regulated inductive learning. To understand the roots of this bias, we examined environmental influences and found that parents of older children are more likely to arrange study sessions in a blocked fashion compared to those of younger children, and school textbooks across elementary grades show a growing prevalence of blocked practice problems, suggesting that family and school contexts reinforce this bias over time. Finally, an intervention that reverses the illusion in adults and leads to advantageous interleaving choices is described.

Keywords: learning, interleaving, metacognition, intervention

Learning through mistakes: The memory benefits of repeated erroneous guesses

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¹Regensburg University, Germany

Testing material before it has been studied can enhance long-term retention, even when initial guesses are incorrect. Using weakly associated word pairs (Experiments 1, 2, and 3) and prose passages (Experiments 4 and 5) as study material, the present study examined whether this pretesting effect is modulated in size when multiple unique guesses are made during learning. First of all, the results of all five experiments revealed a robust pretesting effect: recall performance was higher when a single guess was made during initial learning than when no guessing occurred. Importantly, making multiple guesses during acquisition yielded an additional benefit in recall—not only for young adults (Experiments 1–5), but also for older adults. However, this additional benefit was observed in older adults only when weakly associated word pairs served as study material (Experiment 3), and not when prose passages were used (Experiment 5). Taken together, these findings suggest that generating multiple guesses during learning can facilitate access to the target information at test. In educational contexts, this finding implies that extensive pretesting may serve as a particularly effective learning strategy.

Keywords: episodic memory, learning, pretesting

Disentangling maintenance and retrieval processes in the testing effect: The role of free-recall practice

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Research on test-based learning typically compares restudying with cued-recall practice, showing that testing without feedback reliably enhances long-term retention—a phenomenon known as the testing effect. However, the cognitive mechanisms underlying this effect remain debated. To disentangle maintenance and retrieval processes, we apply a measurement model that estimates their independent contributions to performance. This approach involves two key modifications to the standard testing-effect paradigm: (a) extending the final test to include both cued-recall and free-recall components and (b) administering these tests both immediately and after a delay. We implemented this design to investigate whether free-recall practice produces a testing effect and, if it does, which underlying memory parameters are positively influenced. Notably, free recall has been used far less frequently than cued recall in testing-effect research and, to our knowledge, free recall of paired associates—as opposed to single items—has not previously been examined. By fitting the proposed model to the data, we assess whether free-recall testing (relative to restudying) primarily affects the maintenance of encoded information across the retention interval or the retrieval of that information at final test.

Keywords: testing effect, retrieval practice, free recall, maintenance and retrieval, memory modeling, memory processes, learning and instruction

How Attention Shapes the Forward Testing Effect

Bernhard Pastötter^{1*}

¹Trier University, Germany

The forward testing effect (FTE) describes the robust finding that interim testing on previously studied non-target information enhances learning and memory for subsequently studied target information. The FTE is viewed as a multi-mechanism phenomenon, with contributions from both encoding- and retrieval-based processes. However, it remains unclear which moderating factors (e.g., attentional distraction) influence which underlying mechanisms, and under what conditions. A series of experiments (each $n = 96$) examined whether dividing attention during target encoding modulates the FTE. If the FTE hinges on controlled attentional or elaborative processes at encoding, then distraction should attenuate the effect. Across different materials (word lists, educational text) and outcome measures (free-recall and knowledge-application transfer tests), the prediction held: divided attention reliably reduced the FTE compared to full attention. This pattern emerged consistently for both unrelated and related information linking non-target and target material. The findings support encoding-based accounts of the FTE and identify attentional distraction as a moderating factor that attenuates controlled processes during target encoding. Beyond theory, the results suggest that interim testing is most effective when subsequent learning occurs under conditions that allow for sufficient attentional resources, underscoring the importance of a largely low-distraction learning environment.

Keywords: episodic memory, retrieval practice, testing effects, instructional learning, attention, distraction

Mechanisms of Short-Term Memory: From Sensory Recruitment to High-Level Abstraction

Wednesday, March 18, 09:00 - 10:30, HSZ - N9

Chair(s): Thomas B Christophel¹, Rosanne Rademaker²

¹HU Berlin, Germany

²ESI for Neuroscience of the Max Planck Society, Germany

We are capable of retaining a large variety of visual content in working memory, ranging from simple low-level features to complex naturalistic stimuli. Maintenance of visual information in working memory is accompanied by memory-specific activity across the entire cortical sheet from early visual areas to frontal cortex. Interference between memory content and distractors shapes these representations, as does the passage of time. Here, we bring together experts from cognitive psychology and neuroscience trying to understand the cortical and cognitive mechanisms of short-term memory. Using behavioral work, TMS, single-cell recordings, fMRI, and convolutional neural networks, they assess the representational nature of working memory storage and its interaction with the environment. First, Pablo Grassi asks whether activity in sensory cortex is necessary for the maintenance of visual information. He will present results from three experiments investigating whether TMS pulses applied over visual cortex interfere with working memory performance for low-level features. Michael Wolff will then show that V1 neurons reverse preference between the processing and short-term maintenance of natural images, evident in both spontaneous and evoked (“pinged”) spiking activity. This suggests that neural adaptation acts like a short-term memory buffer in the early sensory cortex. Next, Anna Zier asks which brain regions represent how low-level visual features (like color and motion) are bound into a more complex object in working memory. Using fMRI decoding, she demonstrates that trial-specific binding information can be identified from memory-related activity in early visual cortex (V1-V4). Then, Anastasia Kiyonaga uses CNN derived similarity measures in natural images to show that low-level and high-level interference uniquely affect working memory performance. Intriguingly, interference effects during working memory are inversely related to long term memory recollection, suggesting competition with immediate memory can strengthen longer-term memory. Finally, Joana Seabra shows that during visual working memory several cortical regions utilize categorical, semantic, and spatial representational formats to maintain simple low-level stimuli in a robust fashion.

Keywords: working memory, TMS, fMRI, single-cell recordings, adaptation, feature binding, distraction

What is the causal role of visual cortex in visual working memory?

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Maintenance of visual information in visual working memory (VWM) has been consistently shown to involve memory-specific activity in early visual areas. However, it remains unclear whether this memory-specific activity is in fact relevant for, or reflective of, the storage of visual information per se, or whether it rather reflects feedback-mediated activity from higher-level areas that are responsible for the actual storage of visual information. Accordingly, previous TMS experiments report inconsistent effects of visual cortex stimulation: some report enhancement, others disruption and some no effect on working memory function. Here, we review previous findings and present three novel TMS experiments specifically designed to investigate the causal role of early visual cortex in working memory. Our results revealed retinotopically specific disruption of VWM performance long into the retention time of a visual working memory task, but not during a visual categorization task. However, while we observed an effect on the effectiveness of VWM performance, we did not observe an effect on the fidelity of the working memory representations. We tentatively conclude that this provides causal evidence that early visual areas are involved in VWM in a retinotopic and task-specific manner, but are not central to the storage of working memory items.

Keywords: visual working memory, TMS, early visual cortex, sensory recruitment, non-invasive brain stimulation

Neural adaptation in monkey V1 as a short-term memory buffer for natural images

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The involvement of the early visual cortex during the short-term maintenance of visual information has been demonstrated in human fMRI studies. How and if persistent neural spiking in V1 is crucial for short-term memory is unclear, however. Recently, fading memory traces of natural images have been shown in the population code of monkey V1 neurons. Here, we show that these fading traces were the inverse of the population code during image encoding. This code reversal can be accounted for by a reversal in stimulus preferences of stimulus-selective neurons. This was observable from low-level spontaneous neuronal spiking activity and during visually evoked (“pinged”) neural activity: The neural response to a neutral stimulus during the delay resulted in relatively fewer evoked spikes when the unit’s preferred stimulus had been shown previously, and more when a non-preferred stimulus was shown. These results can be explained by short-term synaptic depression (STD), which could be used as an efficient short-term memory buffer without the need for persistent or elevated neural spiking. Corresponding V1 local field potentials (LFP) revealed a more dynamic and robust population code and did not exhibit a clear code reversal between encoding and memory delay, similar to previous findings from human EEG recordings. We speculate that the complex interactions between the multiple sources of electrical neural activity that underlie LFP and non-invasive neural recordings may obfuscate the STD effects at the single unit level, which could be related to the short-term memory signals in V1.

Keywords: neural spiking, monkey V1, visual short-term memory, natural images, local field potentials, population code

Early visual cortex stores binding information in working memory

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Previous studies on the neuronal basis of working memory have identified brain regions that temporarily store simple visual features like motion direction or color. In contrast, it remains unknown which brain areas temporarily store information about how those features are bound into an object. Participants ($N = 20$) performed four separate functional magnetic resonance imaging (fMRI) sessions. They memorized two objects composed of two visual features each: color and motion direction. We manipulated the feature bindings within these objects across trials. To collect a sufficient number of binding repetitions per participant, each feature varied only across three exemplar categories (color: blue, yellow and pink; motion direction: leftwards, rightwards and downwards). Our procedure allowed to isolate memorized binding information by comparing delay-related fMRI activity patterns between trials in which participants memorized pairs of objects with exactly the same features but the opposite binding. Additionally, the design enabled a comparison of activity patterns between trials that differed in a single feature, thereby isolating feature-specific information. Participants in our study were required to memorize two colors, two motion directions, and their binding on each trial. Despite this high memory load, we successfully decoded memory-related information about both motion direction and color from the early visual cortex (V1-V4). Crucially, we were also able to decode the trial-specific binding information from the memory-related activity in V1-V4. These novel findings indicate that early visual cortex retains specific information both about individual features and about the way these features are bound together.

Keywords: feature binding, fMRI, decoding, MVPA

Competition during working memory enhances long-term memory

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The thoughts and goals we hold in working memory (WM) interact continuously with perception and long-term knowledge. Competition between WM and perception has been a central testbed for neural theories of WM storage, yet the principles that govern this competition remain unresolved. Here, we test how the visual feature overlap between sensory input and WM content influences memory retention. We used artificial neural networks to generate and validate a stimulus set of naturalistic images that varied systematically in high- and low-level visual correlations. These images were used as both WM samples and task-irrelevant sensory inputs in a WM task. Following the WM task, participants completed a surprise LTM test for a subset of the images. After piloting the design, we pre-registered the study and collected two independent cohorts, replicating results with separate stimulus sets ($n = 134$; $n = 136$). We found that sensory input had a non-monotonic effect on WM performance, whereby strongly correlated input progressively reinforced WM, until it crossed a threshold and became interfering. The behavioral impact of sensory input also depended on whether it overlapped with prioritized or deprioritized WM content, as well as the feature distinctiveness of the WM content. Intriguingly, we found that stronger interference during WM predicted better long-term memory. Competition between internal and external representations may therefore promote differentiation processes that ultimately promote durable encoding. Together, these findings help reconcile perplexing discrepancies in the effects of distraction on WM, revealing how the same input can produce distinct behavioral outcomes depending on task context.

Keywords: working memory, incidental encoding, distraction, attentional control, deep neural networks

Visuospatial working memory is cortically enabled through veridical, categorical and semantic representations

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Visual stimuli are subject to categorical biases that impact their recall during working memory. Are these systematic errors also evident in the brain? A single visual stimulus might elicit multiple representations throughout the cortex that differ in content and format, with the latter ranging from continuous to categorical. These categorical neural representations likely constitute a neural correlate of the categorical biases evident in behavior.

Forty participants performed an orientation working memory task while fMRI data were recorded. The nature of cortical orientation representations in response to this task was assessed using multivariate encoding modelling. Additionally, we cross-decoded between orientation and congruent verbal and location stimuli. Our results show that several representational formats are present concurrently across the cortex. These are organized along a gradient of abstraction, with more veridical representations in posterior areas, and more abstract, categorical codes in anterior areas. Regarding the semantic and location stimuli, cross-decoding analyses suggest there is a partially shared neural code between orientations and each of these stimuli. Together, these results suggest that neural representations in response to visual stimuli can simultaneously include categorical, semantic, and spatial formats.

Our findings show that visual working memory relies on representational formats ranging from continuous to categorical, including visuospatial simplifications and semantic depictions of the original stimulus.

Keywords: visual working memory, categorization, neural representational formats, semantics, verbal labels

Traffic and Transport Psychology: Road user behavior and traffic safety

Wednesday, March 18, 09:00 - 10:30, HSZ - 7E02

Chair(s): Arnd Engeln¹

¹Hochschule der Medien, Stuttgart, Germany

Although the amount of traffic deaths in Germany decreases since the early 70s, still nowadays, more than 7 persons lose their lives, and more than 1000 persons get injured in road traffic in average each day. The main reasons are seen in human behavior errors as there are distraction, disregard of priority and inappropriate distances or speeding. That for, the symposium focuses research on human behavior related to traffic safety. The talks focus on research on pedestrians' prediction of other road users' behavior, the perspective of different road user groups on cyclists' behavior as well as the impact of technical innovations on individual behavior – as there are camera-monitor systems in cars and sound reduced cars on the street. With a literature review on existing UX models to inform the measurement of acceptance of automated driving, we then transition to the topic of “Automated driving - acceptance and interaction in traffic”: In the talk session immediately following we will present current research on automated driving. The integration of automated cars into mixed traffic with manual motor vehicle drivers, pedestrians and cyclists generates open questions on how to communicate and interact with them. Solutions should ensure traffic safety as well as acceptance by the traffic participants involved. If acceptance is low, the improvement of traffic safety may fail. The first two talks address research on the impact of external communication on the behavior of manual drivers as well as on other road users. In the following talk the user of the automated car and how to avoid usage errors is focused on.

Keywords: traffic and transport psychology, automated driving, traffic safety

Cautious at the curb: Conservative bias in pedestrian interpretation of vehicle yielding

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Understanding whether vehicles will yield is critical for safe and smooth interactions with both human-driven and automated vehicles (AVs). This study explored (a) how accurately pedestrians can identify whether vehicles will yield (b) the influence of road design, vehicle motion, vehicle type, and explicit communication on accuracy, and (c) the correspondence between subjective certainty and actual accuracy.

Participants viewed short video clips depicting approaching vehicles that either yielded or maintained their speed. The vehicles varied in type and explicit communication: a conventional vehicle without eHMIs, an AV with a mode eHMI indicating automation, or an AV additionally indicating whether the vehicle is currently decelerating. Yielding behavior and road design were also manipulated. After each clip, participants judged whether the vehicle would yield and indicated their certainty.

Participants were accurate overall (86%). They exhibited a (presumably adaptive) conservative bias: false negatives (falsely assuming the vehicle would not yield) far outnumbered false alarms (falsely assuming the vehicle would yield). Mixed-effects analyses showed that accuracy was shaped primarily by braking behavior and road design, while explicit communication improved recognition only when vehicles truly intended to yield, leaving false alarm rates unaffected. Certainty was generally high but varied with cue clarity.

The uncovered interactions underscore the need for integrated vehicle and road design to jointly support accurate and confident intent recognition.

Keywords: uncertainty, decision-making, confidence, perceptual judgment, human factors, vulnerable road users

The impact of monitor position on gap acceptance judgments in camera-monitor systems

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With the growing adoption of camera-monitor systems (CMS) replacing traditional side mirrors in vehicles, new design questions arise regarding the optimal placement of monitors within the vehicle. Unlike mirrors, CMS monitors are not physically constrained to the traditional mirror location, allowing for greater flexibility in monitor placement. However, this flexibility may influence spatial perception, task performance, and workload during driving. In a virtual-reality experiment, we investigated how different monitor positions and image presentations affect drivers' perception and performance in a lane-change scenario. Participants judged the last safe gap (the latest moment a lane change was still perceived as safe) while concurrently performing a visual detection response task, which represents typical visual demands during a lane-change. Four monitor positions were tested: on the A-pillar, next to the steering wheel, and at two positions on the driver's door – one near the conventional mirror position and one farther back. For the latter monitor position, an additional unmirrored (non-reversed) image variant was included to explore whether a non-reversed view, presented in a location that approximates the natural gaze direction of a shoulder check, can facilitate the assessment of the last safe gap. In addition to task performance, in both tasks, we assessed workload and subjective ratings of the monitor variants. The results of the experiment will be presented, and implications for the design of CMS will be discussed.

Keywords: camera-monitor systems, in-vehicle side view displays, digital mirrors, monitor placement, display layout, ergonomic design, last safe gap

Vehicle sound overrules kinematics: Arrival time estimation of accelerating vehicles.

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¹Johannes Gutenberg University Mainz, Germany

Previous work has shown that the availability of vehicle sound improves estimates of the arrival time of accelerating vehicles compared to visual-only estimates, which tend to follow a first-order pattern (i.e., they appear to ignore the acceleration, resulting in dangerous overestimations of the vehicle's arrival time). Here, we studied two potential explanations of the observed effects: a) the vehicle sound directs participants attention towards the accelerated motion, allowing them to make second-order estimates, or b) people continue to use only first-order motion information but shorten their estimates when the vehicle sound indicates acceleration. We presented congruent and incongruent combinations of kinematics (constant velocity or accelerated motion) and sound (sound of an internal combustion engine vehicle (ICEV) driving either with constant velocity or accelerating). Thus, on some trials a constant-velocity motion was accompanied by the sound of a vehicle driving at constant velocity, whereas on others it was combined with the sound of an accelerating vehicle, etc. If the sound of an accelerating ICEV allows participants to make use of the second-order motion information, then it should not affect the arrival time estimates when the vehicle is driving with a constant velocity. In contrast, if they adjust their estimates whenever the vehicle sound indicates acceleration, then they should apply this safety strategy also when the vehicle is driving with a constant velocity. Our results supported the latter explanation. Participants produced shorter arrival time estimates when the sound of the accelerating vehicle was presented, largely independent of the vehicle's kinematics.

Keywords: Audio-visual VR, Time-to-collision estimation, Pedestrian perception, Auditory perception

Exploring the facet structure of user experience (UX): A systematic literature review of existing UX models to inform the measurement of acceptance of automated driving

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The goal of this systematic literature review is to explore published user experience (UX) models and to identify the UX facets they cover. We search ACM Digital Library, Google Scholar, IEEE Xplore Digital Library, ScienceDirect, Scopus, and SpringerLink for studies in English or German that present a distinguishable UX model. The abstracts of the identified records are screened for eligibility, and relevant full texts are analyzed. Data extraction follows a standardized form, and the synthesis is conducted using the best-fit framework approach. The review revisits the facet structure proposed by Engeln and Engeln (2015), reflecting on its value and limitations. Based on the insights gained, the model is further developed and extended. The resulting model should provide guidance for assessing user experience and acceptance in applied contexts, such as automated driving.

Keywords: user experience, systematic literature review, model development

Oculomotor Research in Experimental Psychology: Current Methods, Findings, and Directions

Wednesday, March 18, 11:00 - 12:30, HSZ - N1

Chair(s): Philine Margarete Baumert¹, Celina Kullmann²

¹Rheinische Friedrich-Wilhelms Universität Bonn, Germany

²Department of Psychology, University of Bonn

Oculomotor research has a long tradition in experimental psychology. In humans, visual input provides the highest amount of information per time in comparison to other senses, and about 50% of the neocortex reacts to visual stimuli. With today's technology, eye movements are easy to access, do not rely on participants' subjective reports, and usually do not require complicated task instructions. Their neural basis, both neurochemical and neurophysiological, has been studied extensively. Therefore, they can provide insights into health and disease, numerous aspects of cognition, and can be viewed as an estimate of brain functioning. Despite the field's long history, new methods and technologies open up new possibilities and questions, as well as new pathways to solving well-known problems. Here, we aim to present current methods, approaches, and directions in the field of oculomotor research in experimental psychology. First, Celina Kullmann will introduce the method of latent state-trait modelling and resulting reliability as well as trait and state components of smooth pursuit eye movements. Next, Paul Schmitthäuser will speak on how a new experimental paradigm makes use of saccadic inhibition to assess oculomotor planning and attentional priority. Keaton Dahl will contribute new insights into fixational eye movements and how specific statistical methods can be applied to them in face recognition tasks. Then, Philine Baumert will present findings on how lorazepam influences microsaccades during fixational and exploratory gaze behavior. As a final contribution, Alexander Goettker will shed light on the statistics of natural gaze behavior using mobile recordings and how they compare to laboratory-gained estimates. Overall, the symposium will demonstrate new perspectives as well as recent progress in exciting areas of oculomotor research, underscoring its continued relevance to the field of experimental psychology.

Keywords: eye movements, latent state-trait models, saccadic inhibition, face recognition, microsaccades, natural gaze behavior

GABAergic Modulation of Microsaccades in Sustained Fixation and Free Viewing

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Modulation of gamma-aminobutyric-acid (GABA) A receptor activity via benzodiazepine administration has been consistently found to reduce saccadic peak velocity. While microsaccades are considered part of the fixational eye movement repertoire, their underlying neurophysiology has been hypothesised to resemble that of large saccades. Whether changes to GABAergic receptor activity affect microsaccades in the same way they do large saccades has not yet been investigated in humans. This study's aim was to examine whether the established effect of benzodiazepine administration on saccadic peak velocity could be observed in microsaccades. It was further explored whether this might be task-dependent. Thirty healthy adults were administered either 1mg lorazepam or placebo in a randomised, double-blind, within-subjects design. As microsaccades have been shown to vary in purpose and frequency in a highly task-dependent manner, they were assessed in a sustained fixation task as well as a free viewing task. Lorazepam in comparison to placebo led to a decrease in microsaccadic peak velocity in both tasks. It additionally increased microsaccadic frequency and amplitude during sustained fixation but not during free viewing. Overall, our findings confirm the sublime sensitivity of saccadic peak velocity to modulation of GABA A receptor activity via benzodiazepine administration. Notably, this is the first study to expand this finding to microsaccades. Implications for the neurophysiology of microsaccades as well as for their task-dependent purposes are discussed.

Keywords: microsaccades, GABA, lorazepam, benzodiazepine, peak velocity

Latent State-Trait and Latent Growth Curve Modelling of Smooth Pursuit Eye Movements

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¹Department of Psychology, University of Bonn, Germany

While previous studies indicate mostly good reliability of smooth pursuit eye movement (SPEM) performance, the relative amount of reliable trait and state influences on SPEM has not yet been quantified. However, this is of importance both for experimental and individual differences research. Here, we provide the first study to examine reliability by explicitly distinguishing trait and situational variance of SPEM in the context of latent-state trait (LST) theory. A total of $N = 163$ healthy participants completed SPEM with sinusoidal and triangular movement patterns at three measurement occasions. We used LST and latent growth curve (LGC) modelling to determine model-based reliability and to differentiate between trait variance (consistency) and variance due to influences of the situation and of the person $\times$ situation interaction (occasion specificity). SPEM performance was highly reliable with mostly excellent reliabilities (.86–.98), except for good reliabilities of the intra-individual standard deviation of root mean square error (RMSE) in both tasks (.70–.74). Consistencies showed that, on average, 62% of variance was due to trait influences, while situational influences were smaller (26% on average). There were mostly no trait changes in SPEM performance over time. We conclude that SPEM performance is highly reliable and characterized mainly by a relatively stable trait component, but also by substantial state influences. These findings provide further support of the use of SPEM in experimental and individual differences studies under consideration of potential state influences.

Keywords: smooth pursuit eye movements, latent state-trait, latent growth-curve, reliability

The statistics of natural gaze behavior in active everyday tasks

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Many studies trying to understand natural gaze movements use the presentation of naturalistic images on a computer screen with restrained head movements. However, in the natural world, we often use a combination of eye and head movements to shift our gaze. Here we employ state-of-the-art mobile recording techniques to describe the statistics of eye and head movements during active, everyday tasks and compare them to screen-based tasks. The same group of participants completed three different tasks: (1) free-viewing of naturalistic images on a screen, (2) block building, and (3) copying of an image. Our results provide three key insights. First, an automated movement labeling pipeline allowed us to describe the statistics of natural eye and head movements in active real-world tasks. Notably, a substantial proportion of gaze fixations (around 30%) happen while the head is moving and the gaze is stabilized via the vestibular-ocular reflex. Second, we observed novel gaze strategies that are not observed in the screen-based task. For example, there seems to be a strategic combination of blinks and large head movements. Third, we leveraged reliable individual differences in average gaze statistics (e.g., saccade rate) across tasks to compute the possible level of generalization from the screen to the real world. There were only limited relationships between the screen-based task and the natural tasks, indicating that the passive free-viewing screen-based task is not a good descriptor of active real-world gaze behavior. Together, our results highlight the need to study natural behavior in vivo.

Keywords: Natural behavior, individual differences, eye movements, head movements

Saccadic Inhibition as a Window into Perceptual and Oculomotor Dynamics

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We produce saccadic eye movements at a baseline rate of approximately 2 to 4 per second. Sudden visual transients lead to a rapid reduction in the saccade rate, known as “saccadic inhibition”. While traditionally studied as a phenomenon of motor interruption, this reflexive response can be exploited as a continuous measurement tool of visual sensitivity and thus give access to attentional dynamics in active vision. As such, it is well-suited to current developments in oculomotor research that emphasize ecological validity and methodological innovation.

Here, we introduce a free-viewing paradigm that leverages saccadic inhibition to map spatial patterns of attentional priority and oculomotor planning during unrestricted, self-paced visual exploration. Participants search an array of differently colored tiles for a hidden target under time pressure. Because tile colors signal different target likelihoods, observers adopt systematic search strategies that enable predictions of gaze behavior. During ongoing search, brief probes are presented at controlled distances relative to the current and expected future fixation positions that reliably induce saccadic inhibition. We show that systematic variations in this response provide a moment-by-moment, response-free estimate of attentional and motor priority across the visual field.

By turning a well-characterized oculomotor reflex into a flexible measurement tool, this approach promises a pathway for studying the dynamics of attention in natural vision. Critically, it does not rely on explicit judgments, elaborate task instructions, or disruption of natural gaze behavior, making it amenable to populations for whom explicit responses or complex tasks are challenging.

Keywords: saccadic inhibition, saccade planning, free-viewing, attentional priority, implicit measures

Fixational Eye Movements and Microsaccade Statistics During Face Recognition

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Recently it was found that microsaccade statistics could be used to differentiate visual self-recognition from processing of other people's faces (Schwetlick et al., 2025). In the current study we reevaluated this effect using several oculomotor statistics based on high-resolution (1000 Hz) binocular eye-tracking data. The study seeks to capture subtle temporal and spatial patterns that differentiate between viewing one's own face from viewing the face of a stranger. We developed a multi-stage processing pipeline to detect and organize properties of microsaccades (rates, amplitudes, trajectories) and slow components of fixational eye movements (diffusion constants, Hurst exponent). Using stimulus-locked analyses, we show that this approach allows for the quantification of microsaccade parameters and their relationship to visual attention and face processing. As a potential application we suggest that involuntary, fine-grained oculomotor responses can serve as biometric signatures of self-identification.

Keywords: eye movements, microsaccades, self-recognition, face processing, eye tracking, fixational eye movements, pupil

The Contextual Nature of Decision-Making

Wednesday, March 18, 11:00 - 12:30, HSZ - N2

Chair(s): Jennifer March¹, Nuno Busch²

¹University of Hamburg, Germany

²Technical University of Munich, Germany

What do I want to eat, which item do I want to purchase, and in which stocks should I invest? We make countless decisions every day, but our preferences are typically not stable: They often fluctuate strongly across different contexts and depend heavily on our internal states. This symposium aims to shed light on how decisions are affected across different contexts and states. The contribution by Tibor Stöfel will highlight nutrition as an important factor influencing decision-making. In his talk, he disentangles how different macro-nutritional compositions differentially affect the valuation system in the brain, leading to nutrition-dependent levels of loss aversion in risky choice. In the second talk, Nuno Busch reveals that loss aversion in risky decision-making can also be modulated by the degree of explicit information available about the choice options, and by how we learn about them (i.e., from description or from own experience). In the third talk, Jennifer March will present the mechanisms that give rise to contextual influences on food-related decision making. Specifically, she will demonstrate how subjective values of food options and subsequent choice are altered when presented in bundles. In the fourth talk, Barbara Oberbauer will reveal to what extent search patterns differ depending on the decision goal (i.e., choose the most preferred item vs assess the overall value). Moreover, she will show how the possibility of postponing a decision (i.e., choice deferral) affects search patterns and subsequent choice. The effects of goals on choice also play an important role in the final talk of the symposium, wherein Chih-Chung Ting will demonstrate that flexible decision-making relies on goal-dependent value representations. Together, the symposium combines a diverse range of methodologies, including nutritional manipulations, fMRI, eye-tracking, and state-of-the-art cognitive modelling, to illuminate the contextual nature of choice. The symposium features a multi-ethnic team of female and male speakers at different career stages from three universities across two countries offering rich perspectives and expertise in experimental psychology related to human decision-making.

Keywords: decision-making, choice modeling, context-dependence, loss aversion, food choices, goals, risky choice

Nutritional modulation of risky decision making

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In our daily lives, we often have to make decisions in the face of uncertainty. When decisions involve the risk of potential losses, individuals typically weigh losses more heavily than equivalently sized gains – termed loss aversion.

Prior research has indicated that the catecholamines dopamine and noradrenaline, as well as serotonin, play key roles in this process. Since neurotransmitter synthesis depends on dietary precursors, we hypothesized that our daily nutrition would influence loss aversion. Specifically, by varying the macronutrient composition of a single meal, it is possible to modulate circulating levels of large neutral amino acids (LNAA) such as tyrosine and tryptophan – precursors for catecholamines and serotonin, respectively – and thereby influence neurocognitive functioning.

To test this hypothesis, we collected behavioral data, neuroimaging data, and blood samples from 43 participants (20 female) across two sessions spaced one week apart. In each session, participants consumed one of two isocaloric breakfasts that differed in macronutrient composition (high vs. low carbohydrate-to-protein ratio), designed to shift the balance of tryptophan or tyrosine relative to other LNAA. Three hours post-meal, participants completed a monetary gambling task with varying potential gains and losses.

We applied a drift diffusion model that dissects loss aversion into multiple computational markers. Our analyses revealed a tyrosine-dependent shift in the starting point bias of the decision process towards accepting the gambles. This suggests that the macronutrient composition of a single meal can influence risky decision-making, adding to growing evidence that nutrition can modulate cognitive processes by altering neurotransmitter precursor availability.

Keywords: decision-making, loss aversion, nutritional intervention, amino acids, computational modelling, drift diffusion model

What drives loss aversion across learning contexts in risky choice?

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Loss aversion is one of the most prominent concepts in the study of decision-making under risk. Traditionally, previous research has investigated loss aversion in contexts where participants are aware of the payoff distributions of risky options between which they have to choose (i.e., decisions from description). But to what extent does loss aversion also emerge in situations in which the payoff distributions are initially unknown, and only learned from experiential sampling—that is, in decisions from experience? To investigate this question, we first conducted a meta-analysis, synthesizing and re-analyzing all existing datasets (total $n > 430$ per condition) that allow for a direct comparison of decisions from description and decisions from experience based on mixed gambles (i.e., where the options can lead to either a gain or a loss). Analyzing choices with cumulative prospect theory through a Bayesian multi-level modeling approach revealed substantial differences between learning modes, demonstrating that loss aversion is more pronounced in decisions made from experience compared to decisions made from description. Second, and building on these findings, we ran a large-scale study to address potential caveats of the meta-analysis (e.g., few mixed choice problems, small samples). Our results corroborate the novel and robust description-experience gap. In further analyses, we illuminate potential contributors to the gap in loss aversion between description and experiential paradigms.

Keywords: loss aversion, risky choice, description-experience gap

Understanding the computational mechanism underlying context effects in food bundles

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According to classic economic theory, rational decisions should obey a set of choice axioms (Von Neumann & Morgenstern, 1947). One such axiom, the axiom of independence, states that choice preferences should not be affected by common consequences. While violations of the independence axiom in decisions under risk and uncertainty go back as far as the Allais Paradox (Allais, 1953), our goal is to investigate whether and to what extent violations of the axiom can also be established in choice settings with multi-attribute bundle options. Using a food choice task, we examine whether preference for A over B in binary choice changes when choosing between bundles A + C and bundle B + C, where we systematically vary the multi-attribute similarity of C compared to A and B. Simulations of different choice models, including normalization, expected utility and similarity-based inhibition show attribute-dependent shifts in choice behavior. Specifically, the models make different predictions, when C has very extreme attribute values. We use simulations to optimize our experiment to facilitate differentiation between models. Our results will determine the precise mechanisms that give rise to context effects in multi-attribute bundled choice. We discuss to what extent the results from our food choice task apply to other choice domains and how this adds to the contextual nature of decision-making.

Keywords: dietary decision-making, common consequences, axiom of independence, computational modelling, multi-attribute choice

Goal-dependent value processing: The role of overall magnitude in decision making

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The speed of decision-making is a key metric for inferring cognitive mechanisms across various contexts. Traditionally, factors such as task difficulty—including perceptual discriminability or value differences—have been central to understanding response times (RTs). However, a growing body of research demonstrates that the overall magnitude of options is also robustly associated with RTs: individuals tend to make faster decisions when choosing between highly intense or attractive options. This negative association between magnitude and RTs is also known as the "magnitude effect." In this talk, I will present evidence that overall magnitude not only affects RTs, but also influences other aspects of decision-making, such as how attention impacts choice, across both perceptual and preferential tasks. Furthermore, I will demonstrate that the magnitude effect on RTs is modulated by decision goals. Specifically, when participants are instructed to choose their least preferred option, RTs increase with greater overall magnitude (i.e., higher-value options are further from the decision goal). Conversely, when participants are asked to select the most mediocre option, RTs are fastest at intermediate levels of overall magnitude. These findings suggest that decision makers transform from preference-based to goal-dependent value representations, adapting their decision strategies according to the task goal.

Keywords: Magnitude effect, Goal-dependent decision making, Sequential-sampling model, attention

The cognitive mechanisms of choice deferral

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Contrary to the decision-making behavior that is typically studied in the lab, in many real-world settings individuals are not forced to choose but rather have the possibility to defer decisions to a later point in time. However, the cognitive processes underlying choice deferral remain poorly understood. Two concurrent frameworks describe choice deferral either as (1) a choice process that is prematurely terminated as individuals fail to single out the best option or (2) as an appraisal process in which decisions are deferred if the overall value of all choice options is low.

We aim at elucidating the cognitive process of choice deferral by comparing the similarity of visual search patterns between choice deferral and choice as well as appraisal, thereby leveraging our knowledge about visual search and overall value in choice and appraisal to investigate how people make decisions when having the opportunity to defer.

Participants are asked to evaluate sets of previously rated consumer products under three conditions: (1) selecting the most preferred item, (2) assessing the overall value of the set, and (3) choosing their most preferred item with the option to defer while gaze was recorded through eye-tracking. Importantly, participants are required to complete choice trials that they have initially deferred at the end of the experiment.

We compare search patterns across tasks using representational similarity analysis (RSA) and explore whether search patterns in choice deferral are more similar to choice or appraisal, thereby adding important insights about shared cognitive processes across these tasks.

Keywords: choice deferral, decision-making, eye-tracking, attention, search patterns

Part II: Linguistic and Non-Linguistic Cognition - Cognitive Perspectives

Wednesday, March 18, 11:00 - 12:30, HSZ - N3

Chair(s): Barbara Kaup¹, David Dignath¹

¹University of Tübingen, Germany

This symposium examines the interplay between linguistic and non-linguistic cognition. While some cognitive functions appear to depend on language, others seem rather independent of it and many more integrate both aspects. In psychology, however, the distinction between linguistic and non-linguistic cognition is rarely made explicitly and there is currently no consensus on how language may shape, enable or constrain thought.

The symposium brings together perspectives from cognitive research, developmental psychology and animal cognition to address three questions: (1) How are language and thought related? (2) Which cognitive functions are inherently linguistic, and which are not? (3) To what extent can language modulate domains traditionally considered non-linguistic? Part I of the double symposium brings together comparative and ontogenetic perspectives, focusing on animal cognition and human development. (see detailed description there)

Part II adopts a cognitive psychology perspective. First, Carolin Dudschig examines common mechanisms in linguistic and non-linguistic processing by means of electrophysiological investigations. Rasha Abdel-Rahman's contribution addresses the question of whether language influences the formation of visual representations. Senne Braem investigates how semantic knowledge guides learning of new tasks. Tally Miller tests the influence of verbal labels on the categorization of musical stimuli. Finally, Günther Knoblich discusses the role of linguistic and non-linguistic cognition in joint action.

At the end of the double symposium, philosopher Hong Yu Wong will integrate these diverse perspectives in a concluding discussion, aiming to clarify when, whether, and how cognition harnesses the faculty of language.

Keywords: language and thought, cognitive psychology, N400, mental imagery, verbal labels, architecture of the mind

Parallel Mechanisms in Linguistic and Non-Linguistic Processing: Insights from the N400

Carolyn Dudschig^{1*}

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Language is a central cognitive faculty, yet research on language processing is often conducted in isolation from studies of other cognitive domains. Recent evidence across different disciplines of psychology suggests that linguistic and non-linguistic cognition may share underlying representational and processing mechanisms. Building on this idea, the present study investigates whether the N400, a neural marker of semantic processing, is sensitive to patterns of violation probability in ways that parallel non-linguistic conflict detection. Specifically, it examines how both overall (global) and recent (local) contextual probabilities of violations influence N400 amplitude. The results indicate that N400 responses are reduced in contexts with very frequent violations and are also modulated by the outcome of preceding trials. These findings support the notion that language processing is not entirely domain-specific but instead reflects broader, domain-general principles of cognitive processing - in line with the neural reuse hypothesis (Anderson, 2010). Follow-up studies further explore whether different formats conveying meaning—linguistic and pictorial—are processed as independent sources or integrated within a shared representational system. By highlighting the parallels between linguistic and non-linguistic conflict monitoring, the study contributes to a more integrated understanding of the cognitive architecture supporting human information processing.

Keywords: conflict, N400, language, domain-general mechanisms

Effects of language on mental imagery

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How does mental imagery allow us to represent and simulate the world? Recent evidence suggests that mental imagery, like perception, is influenced by higher-level cognitive factors. Particularly, language and semantic knowledge -both known to modulate visual perception - may also play a role in structuring the content and vividness of mental images. This study investigates how language and semantic knowledge shape mental imagery and what this reveals about the similarities of perceiving and imagining. In two experiments using behavioral measures and event-related brain potentials that reflect basic-level and high-level vision-related brain activity, we investigated the time course of mental imagery of objects. In addition, we investigated influences of object-related semantic knowledge and the categorical structure of native language. In line with theoretical frameworks of predictive processing, our results show that perception and imagery are both active and constructive processes that have early top-down mechanisms in common. These findings suggest that what we see with the mind's eye may be shaped early on by high-level factors such as our world knowledge and the language we speak.

Keywords: mental imagery, linguistic categories, semantic knowledge

Harnessing Semantic Networks for Efficient Task Learning

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Humans are remarkably efficient at learning new tasks, in large part by relying on the integration of previously learned knowledge. However, most of our research on cognitive control typically happens in experiments using abstract and non-tangible stimuli that do not rely on participants' existing semantic knowledge. Here, I will present a series of experiments where we demonstrate how existing, semantically rich distinctions allow for a more robust learning of novel task information. Specifically, through both behavioral analyses and fitting neural network models, we show how pre-existing semantic structures might particularly help with creating more separated task representations, that are more resistant to catastrophic forgetting and can be repurposed to other tasks. Next, I will show how through the use of spatial arrangement tasks, we can tap into pre-existing semantic structures and show how individual differences in sensitivity to semantic dimensions can predict the learning and embedding of entirely new tasks. Finally, I will demonstrate how we can leverage this paradigm to test contemporary theories on the development of cognitive control in prepubescent children. We believe our work helps towards a more integrative understanding of how cognitive control functions are learned and develop through interactions with semantic cognition during novel task learning.

Keywords: continual learning, reinforcement learning, semantic cognition, cognitive control

Enhanced Neuronal Distinction: How Verbal Labels Restructure Perceptual Representations

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³Einstein Center for Neurosciences, Berlin, Germany

A central goal of research on linguistic vs. non-linguistic cognition is to determine not only whether language shapes perception, but how. In this talk, I introduce the Enhanced Neuronal Distinction (END) theory, a neurobiological framework developed in my dissertation, which explains how verbal labels reorganize perceptual circuits through Hebbian and spike-timing-dependent plasticity. END proposes that when words repeatedly co-occur with sensory inputs, phonological circuits are recruited into emerging perceptual assemblies, reducing representational overlap between otherwise confusable stimuli. This results in sharper, more distinct neural patterns—and, critically, in new perceptual discriminations that were previously impossible.

I present converging evidence from behavioral, fMRI, and cross-modal studies showing that novel verbal labels, but not structurally matched nonverbal cues (e.g., musical tones), induce measurable improvements in fine-grained tactile discrimination. These changes are accompanied by increased functional coupling between auditory–phonological and somatosensory cortices, consistent with the END mechanism. The findings support the Language–Perception Causality (LaPeC) hypothesis, which predicts that linguistic input can causally alter perceptual processing rather than merely bias categorization or response strategies.

The END framework clarifies why language uniquely succeeds where other symbolic systems fail: phonological representations possess the combinatorial specificity needed to form distinct, modality-spanning cell assemblies. I conclude by situating END within contemporary debates on linguistic relativity, arguing that language functions not as a passive label system but as a neurobiological force that reorganizes perceptual architecture itself.

Keywords: linguistic relativity, verbal labels, perceptual discrimination, Hebbian learning, Cell assemblies, Cross-modal plasticity, cognitive specificity

Linguistic and Non-Linguistic Cognition in Joint Action

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¹Central European University PU, Vienna, Austria

When individuals act together they coordinate their actions in space and time to achieve joint outcomes. Joint action coordination can be achieved without linguistic cognition. Action prediction supports coordinating the timing and location of individual actions. Exchange of non-verbal communication signals supports aligning action plans. Implicit commitment arising from expectations that individuals will remain engaged in joint action reduce joint action partners' tendency to abandon the joint action in the face of tempting options for individual action. However, linguistic cognition may enhance the efficiency and flexibility of joint action. This includes 1) added opportunities to align plans for joint action, 2) the possibility of distributing tasks and roles in advance, 3) added opportunities for error correction, and 4) explicit forms of commitment that may create strong disincentives for abandoning joint actions. How do linguistic and non-linguistic cognition relate in joint action? One possibility is that linguistic and non-linguistic contributions to joint action arise from a unitary process that reflects alignment at different levels of a predictive hierarchy. Alternatively, linguistic and non-linguistic contributions to joint action could be construed as arising from two independent systems recruiting qualitatively different processes: one system for linguistic interpersonal alignment of mental content and one system for non-linguistic interpersonal alignment of instrumental actions.

Keywords: joint action, coordination, commitment

Communication Strategies in the Age of Polarization

Wednesday, March 18, 11:00 - 12:30, HSZ - N4

Chair(s): Asya Achimova¹

¹Department of General and Computational Linguistics, University of Tübingen, Germany

Verbal communication can act as social glue, facilitating group coherence, or as a social repellent antagonizing people against each other. In this symposium, we bring together social psychologists, psycholinguists, and media scientists to ask how communication strategies have evolved in the age of polarization. While much of the literature on political polarization is based on the U.S. landscape, our workshop brings attention to polarization in Europe. The work of Asya Achimova addresses this question by looking at how speakers in these two cultural spaces choose indirect ways to signal their opinions on societally relevant topics. Her results suggest that German speakers prefer more direct ways of communicating opinions when topics are particularly controversial. We then turn to conversational strategies of Dutch speakers and their use of hedging expressions, such as 'I think'. Liesje Van der Linden investigates how these hedges affect the perception of polarization in discourse. These psycholinguistic studies set the stage for studies of polarizing content in social media. Jürgen Buder will share insights into understanding social media communication strategies in German and US discourse. Gerrit Anders will then take this debate to the actual comments section of the German media outlet "Der Spiegel" and evaluate what types of comments users most often engage with, showing that users are more likely to engage with opposing view and express antagonistic opinions. Looking at the conflicting findings of Jürgen Buder in experimental settings and the findings of Gerrit Anders in field settings will allow us to discuss the role of antagonism in increasing polarization. Finally, we plan to engage with the possible interventions that aim at reducing polarization. Ximeng Fang will share his recent work on a large-scale experimental intervention in which individuals in Germany were matched to form either pairs with congruent or incongruent political views. He will discuss how confronting opposing people affected their antagonism, and whether bringing together similarly-minded individuals increased the risk of creating echo-chambers. In sum, we will look into the role of cultural expectations, personality characteristics of individuals, and the controversy of topics to investigate how they shape communication strategies.

Keywords: polarization, politeness, antagonism, interventions, social media

Navigating controversial topics in interpersonal communication: an experimental study

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Politeness research suggests that speakers soften negative assessments of other people's contributions in order not to hurt their feelings. Computational models of indirect communication motivate this behavior by the speaker's desire to avoid an explicit conflict of opinions. This modeling prediction has been verified experimentally with US-English speakers ($n = 20$, online experiment). However, German speakers ($n = 36$) showed a preference for direct utterances even in the presence of conflict. In this work, we investigate how speakers of German handle scenarios in which they need to share opinions on controversial topics. Participants ($n = 98$) first indicated their opinion on a potentially controversial topic and then chose an utterance that they would use to communicate this opinion to a conversation partner who either had a strongly negative or a strongly positive opinion. We independently assessed topic controversy by asking a different group of participants ($n = 49$) to rate 24 topics that included topics such as women's reproductive freedom, immigration, vaccination, and animal conditions in agriculture. Our data reveal that the participants were sensitive to the potential conflict of opinions: they were more likely to express their opinion indirectly when their conversation partner had an opposite opinion. On the other hand, paradoxically, they were less likely to be indirect when they handled more controversial topics, such as immigration, compared to less controversial ones, such as the quality of public transportation in their city. We discuss these findings in the context of theories of linguistic politeness.

Keywords: indirect communication, politeness, cross-linguistic comparison, controversial topics

Populist Rhetorics in the Media and Acknowledging Subjectivity in Online Discussions

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¹Tilburg University, Netherlands

Today's society is often perceived as more polarized than it actually is (Dekker & den Ridder, 2022) and online debates seem to harden. Previous research has shown that perceived polarization can be decreased within online discussions by adding explicit marking of subjectivity to opinions, e.g. 'I think that...' (Roos et al., 2025). Polarization however sharply increases through populism (Robberts, 2022), which is omnipresent in online debates (Galpin and Trenz, 2019; van der Linden et al., 2025). As populist rhetorics generally do not acknowledge subjectivity (Neubert & Reich, 2018), the current study explores the relationship between populist rhetorics in the media and the positive effect that subjectivity marking has on online discussions. To do so, we conducted a within-subject experiment in which participants read two online news articles followed by 8 comments. The articles were manipulated to either contain a political rhetoric that increased populist attitudes, or one that did not. Half the comments were manipulated to contain explicit subjectivity marking, whereas the other half lacked such marking. The participants had to rate the comments individually on a scale from 0-100, to indicate how well the comment contributed to the overall discussion. Additionally we measured the participants willingness to participate in the discussion, and invited them to write their own contribution. Our preliminary analysis shows that the positive effect of subjectivity marking is also present on the level of individual comments, independently of the rhetoric used in the preceding news article.

Keywords: Polarization, populism, online discussions, subjectivity

From selective exposure to selective response: Evidence for an uncongeniality bias

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Extant research in the tradition of selective exposure studies suggests that individuals prefer to engage with attitudinally congenial content (congeniality bias). However, a shortcoming of selective exposure studies is that participants are only given an opportunity to read attitudinally congenial or uncongenial content. Once an opportunity to respond to content arises, behavior can be markedly different. This is the case in online forums or comment sections. The present talk reports findings from various studies in which participants are exposed to congenial and uncongenial comments and are given the opportunity to reply to these comments (selective response). A common finding in this paradigm is that participants exhibit a tendency to respond to uncongenial comments (uncongeniality bias). The talk charts extant findings on mediators (e.g., liking of comment) and moderators (e.g., perceived quality of comment, discussion climate in the forum, topic knowledge, confidence in knowledge, participant age, personality characteristics, cultural context) of the uncongeniality bias. Moreover, potential effects of responding to uncongenial comments on subsequent attitudinal polarization will be discussed. The talk integrates these findings and proposes a framework that can explain the emergence of both congeniality biases and uncongeniality biases. This provides a novel lens on online behavior that shifts attention from exposure effects to effects of message reception and production in social media contexts.

Keywords: Selective exposure, selective response, online forums, polarization

Dislike and Dialogue: Antagonistic Reply Patterns and Rising Polarization in Online Comment Sections

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Social media research often emphasizes users' preference for congeniality, with users preferentially consuming attitude-consistent information. Yet much less is known about the dynamics that arise when users engage not just with content but with one another. Drawing on large-scale data from two major news outlets – Spiegel Online and the Huffington Post – we examine how reply behavior unfolds in polarized online environments and how such behavior relates to polarization.

Across both platforms (each with more than 20 million comments), we find a consistent uncongeniality bias: users are more likely to reply to comments that are collectively disliked and replies typically invert the evaluative tone of their parent comments, indicating antagonistic response patterns. Replies also receive more extreme evaluations than the comments they address, suggesting localized polarization within threads. Finding these results across both platforms with different language and audiences indicates generalizable behavioral tendencies.

To complement these interaction-level patterns, we also analyze the longitudinal development of polarization. Tracking the variance and fragmentation of opinions, we observe a growing polarization over time independent of specific news topics.

Together, these findings provide large-scale, cross-platform evidence that everyday online discourse is shaped less by homophily than by engagement with disagreement. This leaves an important question. How can digital spaces be designed so that encounters with opposing views can happen while the current tendency toward escalating polarization is restrained?

Keywords: polarization, antagonism, social media, uncongeniality, digital platforms, communication

Can face-to-face discussions about divisive political topics reduce polarization?

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Growing ideological and affective polarization is often attributed to echo chambers' among like-minded individuals and a lack of social interactions among contrary-minded individuals. We study whether in-person discussions about politically divisive topics have the potential to reduce polarization. To do so, we provide quasi-experimental evidence from a large-scale nationwide intervention in Germany that matched pairs of strangers for private face-to-face meetings. On average, conversations with contrary-minded individuals did not lead to a reduction in ideological polarization, but significantly reduced affective polarization, as measured by negative beliefs and attitudes toward ideological out-group members. However, we also provide suggestive evidence that the individual-level effects depend crucially on the manner of discussion. Positive experiences of interpersonal contact during the face-to-face discussion are associated with substantially stronger reductions in affective polarization, whereas less positive experiences appear to nullify these effects or even backfire. This suggests that civility and friendliness of inter-group communication is an important pre-requisite for reducing affective polarization.

Keywords: Affective polarization, ideological polarization intergroup contact, political discussions, natural experiment

Computational and Neuroscience Approaches to Embodied and Grounded Cognition

Wednesday, March 18, 11:00 - 12:30, HSZ - N5

Chair(s): Fritz Günther¹, Markus Kiefer²

¹Humboldt-Universität zu Berlin, Germany

²Ulm University, Germany

Embodied and grounded cognition approaches have remained enduring focal points in cognitive psychology. Although some subtle differences are sometimes postulated, both approaches converge on the assumption that cognition is essentially based on a reinstatement of processes of perception, action and introspection. How exactly the symbols that are central to our higher cognition and communication, such as linguistic forms and abstracted mental representations, obtain their meaning from sensorimotor experience is one of the open challenges in this line of research. Highly interesting experimental-behavioural studies have been conducted that produced important insights. At the same time, we are experiencing the theoretical and empirical limits of this approach: On the one hand, research on embodied cognition is often missing the formalisation, quantification, and precision required to make theoretically substantive advances - a gap to be filled with computational modelling. Here, recent work has brought forward large-scale data-driven representation models built from different data sources, such as language and vision. These allow us to exactly operationalize to what extent information from different modalities of experience shape our semantic representations, and investigate their specific influences on cognitive processes.

On the other hand, theories of embodied cognition ultimately always result in claims about processes in specific cognitive systems (shared between higher cognition and sensorimotor or introspective processing), which are hard to evaluate with purely behavioural approaches and instead require neuroscientific methods. This includes electrophysiological methods with high temporal precision, as well as neuroimaging methods with high spatial resolution; together, these techniques allow us to precisely map neural processes that underpin higher cognition. In this symposium, we bring together recent advances integrating computational and neuroscientific approaches to embodiment research: Computational models yield precise predictions at the system level, which in turn can be tested with neuroscientific methods. The presentations in this symposium highlight the advantage of an interplay of computational and neuroscientific approaches for various fields of embodied cognition such as language, memory and semantics.

Keywords: embodied cognition, grounded cognition, computational modelling, neuroscientific methods

When vision and language act together: Multimodal contributions to false memory formation

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The formation of memory representations is a complex phenomenon shaped by experience, yet the contributions of different experiential sources remain unclear. The present study aimed to assess the role of language-based and vision-based experience in the generation of false memories. To this aim, we employed computational models (CNN and DSM) trained on distinct data types – visual data and language corpora – to independently quantify the similarity between object representations in the visual and linguistic experiential domains. We then examined how these two forms of similarity predict false memories in two parallel variants of a DRM false memory task: a linguistic variant using words and a visual variant using corresponding images. In each task, participants first memorised a list of items and then indicated whether items in a new list were part of the initially memorised one. Consistent with established findings in the literature, higher similarity between unstudied and studied items increased false recognition across both tasks. Critically, both visual and linguistic similarity provided unique and significant contributions to this effect in both image- and word-based tasks, supporting a multimodal and integrated architecture of memory traces regardless of input modality. However, the relative influence of these knowledge sources was modality-dependent: language-based knowledge played a stronger role in the word-based task, while visual prior knowledge dominated in the image-based task. This hybrid and modality-dependent pattern highlights the adaptive nature of memory representations, showing how the human mind dynamically integrates diverse experiential traces depending on task demands.

Keywords: memory representations, false memories, visual experience, language experience, multimodal prior knowledge, vector-space models

Exploring Large Semantic Spaces of Neural Word Representations

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The nature of our conceptual representations – how they're grounded in our experience of the world – remains unclear. Comparing neural semantic maps with vector space models promises to offer insight; yet, large-scale studies are lacking.

We addressed this issue by building large neural spaces for 1,080 abstract and concrete words. We collected EEG data from 40 participants in a Rapid Serial Visual Presentation paradigm (RSVP) and computed each pairwise distance ($N = 582,660$) for each electrode ($N = 128$) and time point. We compared these neural spaces with both language- and image-based models (Word2Vec vs. ViSpa) to examine how visual and linguistic information integrates across time and space. Initial results from five Regions of Interest (ROIs) along the ventral stream show that image-based models account best for neural maps. Notably, semantic coding seems to arise already in the occipital pole, early after word presentation (~100ms). This coding persists to the left Anterior Temporal Pole/Inferior Frontal ROI at later time points (~350ms), particularly for abstract words. Overall, these results suggest that image-based semantic models effectively capture the structure of the neural conceptual system in the ventral stream, pointing to a perceptually-grounded representation of semantics that emerges at very early processing stages. More generally, this situates the results in the framework of embodied and modal cognition, highlighting the central role of perceptual information in shaping our conceptual system.

Keywords: language, embodied cognition, computational modelling, semantic vector models, semantic memory, neuroscience, EEG

Indirect experiential grounding: Semantic similarity of abstract scientific concepts can be decoded from activity patterns in visual and motor cortex

Markus Kiefer^{1*}, Marcel Harpaintner¹, Natalie Trumpp¹, Alexander Berger¹, Fritz Günther², Martin Ulrich¹

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Grounded cognition theories propose that interactions with situations establish experiential memory traces that constitute conceptual meaning. However, as abstract scientific concepts are frequently learned through language, a proposed indirect grounding mechanism postulates that modal representations are extrapolated from distributional language-based representations, which are themselves mapped onto existing modal representations. Using functional magnetic resonance imaging ($n = 51$), we tested the mapping of distributed language representations on modal representations by asking whether semantic similarity of distributional language representations of scientific concepts corresponds to the similarity of neural activation patterns in modal brain systems. Semantic similarity based on both distributed language representations and experiential features was decoded from the multi-voxel activity pattern within occipital and fronto-parietal cortex, overlapping with activation induced by real visual perception and hand action, in addition to multimodal areas outside the brain regions sensitive to perception or action. Although its functional relevance for extrapolating modal representations remains to be determined, this mapping between language and the visuo-motor system is a fundamental element of the indirect grounding mechanism. This mechanism provides sensory-motor experience for the unseen and enriches knowledge for concepts learned exclusively from language.

Keywords: semantic memory, conceptual memory, grounded cognition, embodied cognition, scientific concepts, sensory-motor systems, fMRI

Predictive Gestures: An EEG Study of Multimodal Affirmation and Negation

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¹University of Tübingen, Germany

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Human face-to-face communication encompasses far more than spoken words; it involves a rich combination of multimodal signals such as speech, gestures, facial expressions, and more. Despite this ubiquity of multimodality in communication, the precise role that gestures play in shaping understanding remains to be fully determined. Motivated by experimental evidence suggesting that multimodal information can facilitate comprehension under increased processing demands, we conducted an initial study with an experimental paradigm adapted from basic conflict tasks in cognitive psychology. We manipulated the compatibility of gestural (head shakes/nods & thumbs up/down) and verbal information (yes/no) and investigated whether negation - a linguistic universal that has proven to elicit increased processing demands - would specifically benefit from the presence of multimodal information. Interestingly, we did not find convincing evidence to support this multimodality for compensation account across several behavioral experiments. In contrast, affirmative information seemed to benefit more from the presence of multimodality than negative information. In follow-up studies, we aim to further delineate the integration of multimodal information, with particular emphasis on the function and role of gestures in speech processing and their contribution to predictive processing. The results of these studies - including electrophysiological evidence - will be discussed.

Keywords: gestures, negation, multimodal communication, conflict, EEG

Neural basis of action sequence prediction in communicative function understanding

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For decades, research in the neurobiology of language has focused primarily on how linguistic symbols are processed in the human brain, with a particular attention on the functional role of sensorimotor experiences in this cognitive process. In everyday social interactions, however, linguistic symbols (words and sentences) primarily serve as tools for communication, enabling us to convey our intentions to others. In linguistic-pragmatic theory, these intentions are referred to as speech acts or communicative functions, which are typically embedded in complex contextual settings and sequences of actions. Here, I will present studies examining the neural correlates underlying fine-grained distinctions between different types of communicative action (e.g. naming, requesting, questioning and stating) conveyed through identical linguistic utterances in written, prosodic and gestural modalities. I will show that communicative function understanding emerges very rapidly, around 150 ms after stimulus onset, in parallel with semantic processing, and is associated with distinct brain activation patterns that reflect specific pragmatic functions. In particular, communicative actions that typically elicit motor-related partner responses, such as handing over an object after a request or giving a verbal reply to a question, trigger somatotopic activation in the motor cortex (e.g., hand vs. face regions). I argue that the embedding of linguistic symbols into action-related schemas highlights the contribution of the motor cortex, whose rapid activation suggests a crucial role in the pragmatic understanding of communicative functions.

Keywords: Communicative functions, sensorimotor cortices, EEG, action sequence structure, Neuropragmatics.

Mixed-Topic Talks

* Asterisks indicate presenters

Masking speech with pink noise or speech babble induces metacognitive illusions in judgments of distraction

Monday, March 16, 09:00 - 10:30, HSZ - N8

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Two experiments served to test the hypothesis that partially masking speech with pink noise (Experiment 1) or speech babble (Experiment 2) induces metacognitive illusions in judgments about the distracting effects of task-irrelevant speech on cognitive performance. Separate validation experiments have shown that masked speech is experienced as being disfluent relative to pure speech. If people rely on a (dis)fluency heuristic, masked speech should be predicted to be more distracting than pure speech. However, given that pink noise or speech babble mask the changes in the speech signal that drive auditory distraction, people should objectively be less distracted by masked speech than by pure speech in a serial-recall task. The results of both experiments support these hypotheses. Speech masked with pink noise or speech babble evoked a subjective experience of relative disfluency and both types of speech were predicted to be more distracting than pure speech. However, participants were objectively less distracted by masked speech than by pure speech. Even after multiple firsthand experiences of having ignored masked and pure speech during the serial-recall task, participants judged masked speech to have been more, not less, distracting than pure speech. Partially masking speech thus had opposite effects on judgments of distraction and objective distraction, providing evidence of pronounced metacognitive illusions in judgments of distraction.

Keywords: Speech masking, auditory distraction, metacognition of auditory distraction, judgments of distraction, (dis)fluency heuristic, metacognitive illusions

Measuring the bookend effect

Monday, March 16, 09:00 - 10:30, HSZ - N8

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We recently introduced a novel visual motion illusion called the bookend effect (Riga et al., 2025). The name relates to the fact that when a horizontal row of illusory elements (e.g., furrow illusion or double drift elements) physically move together, the perceived illusory direction of the group is strongly determined by the two outer “bookends”, even if the inner “books” have opposite illusory trajectories. We hypothesize that the visual system creates a single, unified object representation due to spatial proximity and shared physical movement, with the more salient bookend elements dominating the perceived motion direction of the entire configuration. The effect does not rely on crowding, as both the static and dynamic features of the inner books can easily be reported. However, those features appear to play little if any role in establishing perceived group direction. Here, we present a novel series of psychophysical experiments to explore how and when the bookend effect occurs, and to assess whether the inner book elements are ever able to exert any influence on the overall group motion. More generally, we believe that the bookend effect has potential to provide new insights into our understanding of “common fate” in the context of illusory motion.

Keywords: motion perception, visual illusions, illusory motion, peripheral vision, crowding, grouping

Can I trust in what I see? - EEG evidence for reliability estimations of perceptual outcomes

Monday, March 16, 09:00 - 10:30, HSZ - N8

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During observation of an ambiguous figure perception becomes unstable and alternates between different interpretations. Tiny low-level changes can disambiguate an ambiguous figure and thus stabilize its percept. We compared ERPs evoked by ambiguous stimuli and disambiguated stimulus variants across different visual categories (geometry, motion) and complexity levels (up to emotional face expressions). Disambiguated stimulus variants cause stable percepts and evoke much larger amplitudes of two positive ERP components than ambiguous stimuli ($d > 1$). This pattern of results is highly consistent across visual categories and complexity levels. The generality of our findings across categories and complexity levels points to higher-level/ cognitive mechanisms: Given a priori incomplete, noisy and ambiguous sensory input, we postulate a high-level Bayesian inference unit that evaluates the reliability of perceptual processing results. Large ERP amplitudes would reflect high perceptual reliability.

Keywords: Ambiguous Figures, Necker cube, Multistable Perception, Perceptual Uncertainty, EEG, Event related potentials, ERP Uncertainty Effect

The Beep-Speed Illusion Reflects Conscious Visual Experience Rather Than Response Bias

Monday, March 16, 09:00 - 10:30, HSZ - N8

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When two objects move randomly across a screen and occasionally change direction, brief beeps synchronized with the direction changes of one object increase its perceived speed relative to the other. This so-called beep-speed illusion has been demonstrated in two-alternative forced-choice tasks, in which participants choose which of two objects appears to move faster. A common critique is that differences in perceived speed may not reflect conscious visual experience but could arise from response biases.

In the present study ($N = 65$), we tested this possibility by comparing the beep-speed illusion across two paradigms: a two-alternative forced-choice task and an equality-judgment task. In both tasks, participants viewed two moving objects. One object always moved at 4.5 degrees of visual angle per second, with direction changes synchronized with brief beeps. The speed of the other object varied across trials from 2 to 7 degrees per second.

In the two-alternative forced-choice task, participants indicated which object they perceived as moving faster. We fitted a psychometric function to these responses and extracted the point of subjective equality as an index of the magnitude of the beep-speed illusion. In the equality-judgment task, participants reported whether the objects appeared to move at the same or different speeds. For these responses, we fitted a normal distribution and estimated the shift of its center as an index of the illusion's magnitude.

We observed the beep-speed illusion at a similar magnitude of 4–5% in both tasks, ruling out the alternative interpretation that it arises without entering visual awareness.

Keywords: audio-visual perception, audio-visual illusion, audio-visual attention

A modular image-computable psychophysical spatial vision model with multi-stage noise

Monday, March 16, 09:00 - 10:30, HSZ - N8

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To explain the initial encoding of pattern information in the human visual system, the standard psychophysical spatial vision model is based on channels specific to spatial frequency and orientation, followed by divisive normalization (contrast gain-control). Schütt and Wichmann (2017, *Journal of Vision*) developed an image-computable implementation of the standard model and showed it to be able to explain data for contrast detection, contrast discrimination, and oblique and natural-image masking. Furthermore, the model induces a sparse encoding of luminance information. Reichert and Wichmann (2024, *VSS, Journal of Vision*) provided a modern, efficient, automatically differentiable implementation of this model enabling easy and fast training of model parameters on image data. We extend Reichert and Wichmann's implementation by allowing learning of spatial and spatial-frequency parameters of contrast gain-control and the addition of different kinds of noise anywhere in the processing pipeline. Using the same psychophysical data as Schütt and Wichmann, we compare our model's predictions of contrast detection, contrast discrimination, and oblique and natural-image masking with the previous implementation. Moreover, we discuss possible interactions between the newly learnable parameters and effects of multi-stage noise on the image-processing pipeline.

An advantage of our model is its modularity and automatic differentiation because this facilitates rapid implementation, addition, and testing of new components of the standard spatial vision model. Furthermore, our framework allows the integration of this psychophysically validated spatial vision model into larger image-processing pipelines such as deep-learning and other artificial-intelligence models, where it may increase performance or energy efficiency due to its relative simplicity.

Keywords: computational modelling, early vision, spatial vision, noise

Visual search in children: New insights from an adaptive educational game

Monday, March 16, 09:00 - 10:30, HSZ - N8

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Whenever we search for our preferred jam at the supermarket, we are engaged in a complex visual search task. But how is this skill acquired? In this study, we analyzed data from an online educational game similar to the card game "Set". The game's objective is to identify sets of three cards that either share features or have entirely distinct features across several dimensions. The objects on the cards vary in number, color, shape, and shading, and players must identify the correct set of targets among a range of distractors. We developed measures of perceptual salience for targets and distractors by counting shared attributes (e.g., all targets have two symbols) and distinct features (e.g., the symbols on all targets have different colors, such as purple, green, and yellow). Across 1,169 game items played by thousands of elementary school students, we found that the more features targets share, the easier it is to identify the set. Likewise, the more similar the targets are to distractors, the more challenging it becomes to find the set. However, the similarity among distractors did not influence item difficulty. Furthermore, we find that not all feature dimensions are treated the same by the children. Card sets that share filling and color were easier to identify for kids than card sets that share shape or number. In addition, the difficulty decreases with each additional shared feature. Overall, the study provides a new approach to investigate more complex search tasks.

Keywords: Visual search, online education, perceptual salience, Bayesian modeling

Identifying the cognitive and affective dynamics of correcting climate misinformation via short-form videos

Monday, March 16, 09:00 - 10:30, C-Building - N16

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Correcting misinformation is crucial for addressing societal challenges like climate change, as its propagation erodes trust in science. While the continued influence effect (CIE) is well-studied in text, effective correction strategies for video-based social media content remain largely unexplored. This is an urgent gap given that AI-driven tools now facilitate the rapid dissemination of misleading synthetic content. This study examines factors that optimize correction efficacy in this digital context. We conducted a pre-registered online experiment ($N = 879$) exposing participants to a short-form AI-generated video containing prevalent climate misinformation (i.e., that volcanoes emit more CO_2 than humans). We tested interventions using a 2x2 design, crossing correction content (causal alternative vs. simple retraction) with multimedia signaling principles (high vs. minimal), alongside two control groups. Preliminary results indicate that all corrections significantly reduced misinformation reliance compared to the misinformation control ($d = -0.83, p < .001$). Causal alternatives were significantly more effective than simple retractions ($\beta = -0.13, p < .001$). Crucially, a marginally significant interaction emerged ($p = .093$), showing that high signaling (reducing extraneous cognitive load) disproportionately benefited the more complex causal alternative. Mediation analysis confirmed this mechanism: high signaling increased perceived processing fluency, which in turn significantly reduced misinformation reliance (indirect effect $p = .025$). This research advances mechanistic understanding of the CIE in video formats and yields theory-driven guidelines for effective science communication. By combining explanatory depth with cognitive scaffolding, practitioners can better counter the rising threat of synthetic climate misinformation.

Keywords: climate change, climate misinformation, continued influence effect, ai-generated short-form videos, misinformation correction, processing fluency, psychological discomfort

Do laypeople differentiate between anecdotal and empirical evidence in science communication?

Monday, March 16, 09:00 - 10:30, C-Building - N16

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Anecdotal evidence is regarded highly by actors in the educational sector. While sometimes informative, misinterpretation of its evidential value can further the spread of misinformation and lead to undue conclusions. Therefore, it is important to understand how laypeople assess anecdotal compared to empirical evidence. We hypothesized that texts containing empirical evidence are rated as more credible and more appropriate for supporting action- and policy-oriented measures than texts containing anecdotal evidence. We also assumed that this advantage of empirical over anecdotal evidence increases with more sophisticated epistemological beliefs of participants. We examined these hypotheses in two preregistered experiments ($N_1 = 427$, $N_2 = 473$). Although a manipulation check showed that participants correctly recognized the type of evidence presented, our hypotheses were not supported. Neither effects of evidence on message credibility, perceived appropriate support for resulting measures, nor a moderation effect of epistemological beliefs were registered. However, there was a significant main effect of epistemological beliefs on the dependent variables. The more sophisticated people's epistemological beliefs, the lower they rated message credibility and perceived appropriate support—independent of the type of evidence provided. Although participants with more sophisticated epistemological beliefs appear to rate evidence in science communication about educational insights more critically, they did not regard the type of evidence differently. This non-discrimination of evidential value between anecdotal and empirical evidence is critical for decision processes, which should not be based on weak anecdotal evidence. This makes the need for interventions promoting evidence-based thinking and action even more apparent.

Keywords: evidence-based thinking and action, credibility, science communication, educational sciences

How social evaluative feedback shapes social evolution: Neuronal and behavioral measures

Monday, March 16, 09:00 - 10:30, C-Building - N16

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Social evaluations in interactions are a primary aspect of communicating with others, as they reveal how we judge others and how they judge us. The exchange of evaluations allows us to make self- and other-related updates, yet the processes of aligning and integrating social evaluative feedback in realistic interaction scenarios are largely lacking. I will provide an overview of three recent studies examining how social evaluative feedback alters the self-view, the feedback sender's opinion, and feedback expectations. In these studies, participants rated themselves on 180 trait adjectives, depending on the study, either in a first session or immediately after a real social interaction, and received feedback from senders with different supposed characteristics (experts, peers, computer). The feedback on the adjectives was manipulated to be worse, congruent, or better than the participants' self-ratings, while EEG was recorded. I will include relationships between updating and Event-Related Potentials (ERPs) from EEG, as well as between ERPs and hemodynamic responses from ongoing EEG-fMRI studies. Finally, the pathological mechanisms underlying the altered integration of social evaluative feedback will be addressed. Specifically, the role of depressive symptoms in fostering a lower integration of positive feedback and better integration of negative feedback will be presented. The results contribute to a deeper understanding of how individuals process and integrate social evaluative feedback and its relation to neuronal responses and pathological symptoms.

Keywords: social evaluative feedback, self-view updating, other-view updating, expectation, EEG-fMRI, individual differences

Does Need for Cognition predict all kinds of mental effort, or just the academic kind?

Monday, March 16, 09:00 - 10:30, C-Building - N16

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According to various domains of psychology, people are cognitive misers, resource rational, and generally averse to mental effort. And yet, people find it enjoyable to read books, watch films, play games, solve puzzles, etc. Studies attempting to show that people willingly exert mental effort rarely find unanimous support, with people differing in the extent to which they engage with various cognitive tasks. The "Need for Cognition" scale is supposed to explain such individual differences. However, the kinds of tasks that are used in mental effort experiments tend to be 'academic' in nature (e.g., anagrams, arithmetic, puzzles), suggesting that the scale may be more reflective of interest and engagement in a particular kind of mental effort. Here, we develop four different tasks - two of which are academic (a word- and number-based game) and two that are more generally interesting (a dating- and a sports-based game). Participants are asked about their interest in the different tasks and then assigned to either their first or last choice (or assigned to a task at random). After performing the task for several minutes, participants complete the Need for Cognition scale, and self report their effort, engagement, frustration, boredom, and comfort with the background knowledge necessary to perform the task. We use these data to test the idea that Need for Cognition predicts mental effort regardless of the type of task, and regardless of whether the task was something they would prefer to do.

Keywords: mental effort, need for cognition, boredom

Beliefs in conspiracy theories are more often incoherent

Monday, March 16, 09:00 - 10:30, C-Building - N16

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Believing in conspiracy theories has often been found to be associated with having incoherent beliefs, although different measures of association and of incoherence have led to somewhat varied findings. Here we formalise pairs of incompatible conspiracy beliefs as logical contraries. Contraries cannot both be true but they can both be false, the latter being the case e.g. when the official version of events holds. For example, it cannot both be true that (a) Diana faked her own death and that (b) she was killed by the British secret service. But (a) and (b) can both be false if Diana's death instead resulted from a car accident. We operationalise coherence as probabilistic consistency in a Bayesian framework, and measure extent of incoherence as the Cartesian distance to the nearest response that would have been coherent. These measures are arguably more precise and less susceptible to confounds than previous proposals. Based on these measures we reanalysed the data from 8 studies involving 8590 participants, using zero-inflated generalized linear mixed models with individuals and studies as aggregation levels, and including the maximum random effects structure justified by the design. Our findings replicate the positive association between beliefs in conspiracy theories and incoherent beliefs - both in terms of the relative frequency of incoherence and in terms of the distance from the nearest coherent response. We discuss potential implications for ways of conceptualising and addressing conspiracy beliefs.

Keywords: conspiracy theories, incoherence, Bayesian

The truth effect depends on Need for Cognition: New insights from Bayesian hierarchical latent-mixture models

Monday, March 16, 09:00 - 10:30, C-Building - N16

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People tend to judge repeated information as more valid than new information, a phenomenon known as the truth effect. While this effect is robust on average, recent research shows that it is not universal: some individuals show strong truth effects, whereas others show none. Understanding these differences is key to revealing the cognitive mechanisms underlying belief formation and developing interventions that promote more accurate truth judgments. To capture this variability, recent methodological advances have introduced Bayesian hierarchical latent-mixture models to classify individuals into latent classes that differ qualitatively in their behavior. We extend this approach by including covariates as predictors of class membership and demonstrate the validity and robustness through simulations. We applied the model to two datasets examining how the truth effect relates to Need for Cognition (NfC), the tendency to enjoy and engage in effortful cognitive activities. Individuals higher in NfC process information more deeply, which should increase processing fluency and, in turn, strengthen the truth effect - yet prior research has been inconclusive. Across both datasets, we replicated the previously reported two-class structure (positive and null truth effects) and found that individuals higher in NfC had a higher probability of belonging to the positive truth-effect class, even in a dataset where traditional analyses failed to detect a relationship. We thus make both a methodological and substantive contribution by (a) demonstrating Bayesian hierarchical latent-mixture modeling as a powerful framework for investigating qualitative individual differences, and (b) providing clearer evidence for the relationship between NfC and the truth effect.

Keywords: truth effect, individual differences, need for cognition, Bayesian hierarchical models, latent class models, hierarchical latent-mixture models

Cross-modal correspondence: absolute or relative?

Monday, March 16, 11:00 - 12:30, HSZ - N8

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There is a longstanding dispute on the nature of cross-modal correspondences. Observing transitive cross-modal matches, von Hornbostel (1931) concluded that they are absolute, irrespective of their context, and mediated by a common intensity scale shared by almost all modalities. Cohen (1934) rejected the transitivity property on empirical grounds, and suggested that cross-modal matches are relative, depending on the relative position of the judged stimuli in their respective modality. Available experimental results, interpreted as falling half-way between the predictions derived from absolute and relational theories, cannot contribute to resolve the issue in favor of one of the theories, and call for a new perspective. Global psychophysics, in its extension to the cross-modal case, offers a kind of hybrid approach, combining absolute cross-modal correspondences with relational judgments. The talk discusses previously published and new empirical evidence in the context of this framework, and investigates the implications on properties of cross-modal matches, like transitivity.

Keywords: cross-modal correspondence, cross-modal matching, global psychophysics

Is emotional valence preserved in global scene gist? Evidence from an evaluative conditioning study

Monday, March 16, 11:00 - 12:30, HSZ - N8

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Scene gist refers to the ability to rapidly process the dominant meaning of a visual scene within the first ~100 ms of presentation. It is assumed that the gist especially relies on global and holistic information, such as the spatial layout. Research has shown that modified images (e.g., by the algorithm by Oliva & Torralba, 2006), designed to represent this “unique shape” of a scene can also trigger above-chance categorization of scenes. Our study examines whether emotional scene gist is preserved in global gist information. Therefore, valence connotations of initially neutral scenes were induced by evaluative conditioning. For conditioning, scene images were paired with five-second music clips evoking positive or negative emotions. Explicit ratings confirmed conditioning for these scenes. Most important, in an evaluative priming task, both the unmodified scenes and algorithmically transformed versions created with the Oliva and Torralba algorithm (OT6) served as 100ms primes for valence judgments of adjectives. We found an evaluative priming effect (shorter RTs for congruent prime-target pairs) for unmodified images, corresponding to the conditioning effect assessed by ratings. OT6 images did not cause a priming effect in the overall analysis. A post-hoc analysis, however, indicated that for those participants with a clear conditioning effect (according to ratings), there were significant priming effects for both unmodified images and OT6 images of equal strength. For the rest of the sample, priming effects for unmodified images were marginal and non-existent for OT6 images. Thus, we cautiously conclude that initial evidence for the basic hypothesis was found.

Keywords: Scene gist, Emotional gist, Rapid scene processing, Evaluative conditioning, Evaluative priming, Affective priming

Modality-general sensitivity of pupil responses to regularity violations

Monday, March 16, 11:00 - 12:30, HSZ - N8

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Pupil dilation responses (PDRs) are reliable physiological indicators of arousal in response to unexpected events in different sensory modalities. However, a direct comparison of PDRs between modalities is currently lacking. We investigated PDRs in response to transitions between regular and random sequences of visual dots (Experiments 1-3) and auditory tones (Experiment 3). In Experiment 1, we observed PDRs when a regular visual sequence transitioned to a random one, but not for the reverse transition. Transitions between two regular sequences elicited weaker PDRs on average. Experiment 2 replicated these results, confirming the robustness of the observed patterns of PDRs. In Experiment 3, we compared PDRs to visual and auditory versions of the same sequences and transitions. We found strong cross-modal similarities in pupil dynamics, particularly for transitions between regular and random sequences. Remarkably, these similarities were also evident during baseline trials without explicit transitions. To further characterize these effects, we decomposed the pupil time series to extract phasic pupil dilation events. dilation event patterns mirrored overall pupil time series, with modality-specific differences in event amplitude emerging for the transitions between distinct regular sequences. Taken together, our findings suggest that pupil-linked arousal reflects inference of statistical structure and its violations, demonstrating substantial correspondence across sensory modalities. The study was supported by the German Research Foundation (DFG): SFB 1233, Robust Vision: Inference Principles and Neural Mechanisms, TP C1 (previously TP 05), No 276693517, Max Planck Society and Humboldt Foundation (PD), and Machine Learning Cluster of Excellence, EXC 2064/1 No 39072764 (VF).

Keywords: Pupil size, arousal, uncertainty, visual regularities, auditory regularities

Blood, Sweat and Blinks: The Effects of Task and Team Mental Workload on Cardiovascular, Electrodermal and Ocular Activity.

Monday, March 16, 11:00 - 12:30, HSZ - N8

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Understanding mental workload is central to ergonomics, as it affects performance and well-being. Eye-based and physiological measures offer promising workload indicators, yet their validity in collaborative contexts, where task and teamwork demands interact, remains underexplored. This experimental study examined the effects of two components of workload during team tasks, team mental workload (teamMWL) and task mental workload (taskMWL), on ocular, electrodermal, and cardiovascular activity. Thirty participants completed a dual-task paradigm involving verbal interaction with a simulated team alongside a reaction-time task using stimuli from a cooperative video game. Within a 2×3 repeated-measures design, teamMWL and taskMWL were manipulated, and multilevel mixed-effects models were used to analyze their effects on physiological markers. Related variables were grouped using exploratory factor analysis, yielding latent factors representing underlying physiological phenomena. These factor-derived variables were entered into the models to analyze workload-related physiological responses. Analyses included control variables to account for confounds (e.g., gaming experience), and manipulation checks verified the effectiveness of the workload manipulations. While electrodermal activity was not sensitive to changes in teamMWL or taskMWL, the two workload components exerted distinct, sometimes opposing, effects on ocular and cardiovascular metrics. For instance, a factor representing fixation behavior decreased with higher teamMWL ($\beta_{\text{standardized}} = -0.33$, FDR-corrected $p = .001$) but increased with taskMWL ($\beta_{\text{standardized}} = 1.03$, FDR-corrected $p < .001$). These patterns likely reflect different coping strategies or by-products of task and teamwork demands, indicating differential impacts of task- and teamwork-related workload on visual attention and autonomic activity.

Keywords: cognitive load, team collaboration, psychophysiology, eye-tracking, dual-task paradigm, simulation

Perceptual grouping influences capacity and attention in visual short-term memory

Monday, March 16, 11:00 - 12:30, HSZ - N8

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Verbalizable material such as numbers can enhance short-term memory capacity when individual units are grouped into chunks (Miller, 1956). In visual short-term memory (VSTM), perceptual groups can serve a similar chunking function. To date, however, increased capacity has been demonstrated only for grouping by identical colors, but not by identical shapes (Quinlan & Cohen, 2012). Previous research suggests two psychological mechanisms underlying the influence of perceptual grouping in VSTM. First, grouping reduces overall memory load: all items, including singletons, benefit from the presence of a perceptual group (see Thalmann et al., 2019, for a corresponding result from verbal working memory). Second, attention is automatically biased toward grouped items (Kimchi et al., 2007; Morey et al., 2015), increasing their likelihood of being encoded while reducing that of singletons. Together, these mechanisms explain why grouping effects are typically observed only for grouped items. Across three experiments using a change detection paradigm, I show that a stochastic model integrating capacity and attentional mechanisms accounts for the observed data with high accuracy. Moreover, I demonstrate a capacity benefit for shape-based grouping—provided that shape discrimination is easier than the corresponding color discrimination.

Keywords: visual short-term memory, perceptual grouping, visual attention

A Visual Sensory Memory Test using full-field hierarchical 1/f noise

Monday, March 16, 11:00 - 12:30, HSZ - N8

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The Visual Sensory Memory Test (VSMT) assesses sensory memory using pink-noise stimuli. These stimuli are square, with a random, cloud-like pattern of light and dark regions with characteristic spatial structure. Their 1/f spatial frequency spectrum makes them particularly well suited to the human visual system. In the classical version of the VSMT, the pink-noise stimulus is restricted to the central region by multiplying it by a Gaussian envelope. This gradually reduces contrast towards the four borders of the square, so that clear perception is possible only in the center. We examined whether employing the Gaussian envelope affects performance. In addition, we introduced a new method for generating 1/f stimuli: a hierarchical algorithm that yields a well-identifiable stimulus for a given random seed, independent of the final image resolution. This approach facilitates comparisons between studies conducted on devices with different screen resolutions. Thirty participants completed the VSMT with and without the Gaussian envelope. We found no significant differences between conditions. Moreover, there was no evidence of unwanted memorization strategies, such as focusing on the stimulus borders when the Gaussian envelope was omitted. Participants reported that the full-field stimuli were slightly more comfortable to view.

Keywords: sensory memory, pink noise, hierarchical noise

Mindfulness Experience and Metacognitive Monitoring in Young Meditation Practitioners

Monday, March 16, 11:00 - 12:30, C-Building - N16

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Mindfulness-based meditation involves close observation and reflexive contemplation of one's own experience and can be seen as a practice that promotes cultural learning of metacognition. Theoretical models propose metacognition to be one of the underlying cognitive mechanisms of mindfulness. However, only few studies have examined metacognition objectively with laboratory tasks in relation to mindfulness. Here, we investigate whether the metacognitive process of monitoring and its accuracy are associated with mindfulness-based meditation practice. In total, $n = 61$ young meditation practitioners and $n = 63$ non-practitioners completed an adapted metacognitive visuo-spatial working memory task and provided monitoring judgments after each trial (confidence judgments [CJ] regarding recall performance). Monitoring accuracy was operationalized as the relationship between CJ and objective performance. All participants completed a self-report mindfulness questionnaire (MAAS), and practitioners a questionnaire on meditation depth as well as open questions regarding their meditation practice. Overall monitoring accuracy was significant ($\gamma = .55$, $p < .001$), indicating that participants were sensitive to variations in their memory performance. However, no group differences between practitioners and non-practitioners were observed, except for the MAAS ($t = -3.14$, $p = .002$), reflecting that practitioners reported higher levels of mindfulness. Within the group of practitioners, no features of meditation practice, nor questionnaire scores were significantly correlated with monitoring accuracy. Possible reasons for our null findings are discussed including the object of monitoring and the level of consciousness assessed in our metacognition task. Future research should consider the various conceptualizations of meta-awareness within contemplative traditions and its overlap with different facets of metacognition.

Keywords: Metacognition, mindfulness, working memory, metacognitive monitoring.

How Polarity Correspondence influences Self-Prioritization Effects

Monday, March 16, 11:00 - 12:30, C-Building - N16

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Self-prioritization effects (SPE; Sui et al., 2012) and related we-prioritization effects (WPE; Constable et al., 2019) are typically interpreted as reflecting genuinely prioritized processing of self-related stimuli. We propose that these effects can, at least in part, be explained by the Polarity Correspondence Principle (PCP; Proctor & Cho, 2006). According to the PCP, binary classification tasks involve asymmetric processing of stimulus and response alternatives: one category serves as the reference (+ polar), while the opposite category is evaluated relative to it (– polar). Responses are faster when stimulus and response poles correspond. We assume that in matching tasks, self- and other-related stimuli as well as response alternatives are processed asymmetrically, with self-related stimuli and matching responses as reference categories (+). The SPE thus arises because self-related matching trials exhibit polarity correspondence, whereas other-related matching trials do not. To test this, participants learned associations between geometric shapes and self- or other-relevant labels. In a between-subject design, they affirmed either “mono-combinations” (label and shape refer to the same person) or “duo-combinations” (label and shape refer to different persons). According to the PCP, matching self-related trials are “+++” in the mono condition but “++–” in the duo condition. As predicted, a clear SPE emerged in the mono condition but was significantly reduced in the duo condition. Applying the same logic to the WPE yielded similar results. These findings suggest that a substantial part of self- and we-prioritization effects can be accounted for by the Polarity Correspondence Principle.

Keywords: self-prioritization effect, polarity correspondence, asymmetrical processing, self-relevance

Flexible balance adjustments under cognitive dual-task demands: An event-related force-plate approach

Monday, March 16, 11:00 - 12:30, C-Building - N16

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Cognitive-motor interference research investigates the interaction between cognitive and motor processes. A novel approach analyzes balance control parameters while participants stand on a force plate using an event-related method to examine the influence of single cognitive processes on balance control. In the present study, we applied this approach to a cognitive dual-task paradigm combining a visual-vocal short-term memory task with a delayed vocal response, with an auditory-manual reaction time (RT) task. We varied the stimulus-onset asynchrony (SOA: 100 vs. 1,000 ms) between the targets and task load (report vs. ignore the visual object). Additionally, task load varied unpredictably (trial-by-trial) or predictably (in blocks). This hybrid psychological refractory period (PRP) paradigm created a processing bottleneck during memory consolidation of the visual object and response selection of the auditory target. Auditory-manual RTs increased at short compared to long SOA and during report compared to ignore trials. Force-plate data showed that participants were less likely to adjust balance during cognitive task processing and more likely after task completion, independent of a cognitive bottleneck. However, we also showed that the differing (previous) trial length of report vs. ignore trials lead to a different course of force-plate data. In a replication experiment, which keeps the length of report and ignore trials comparable, we expect to replicate findings from our first experiment and eventually find an influence of the cognitive bottleneck on balance adjustments. With the replication experiment, we want to further investigate whether balance control flexibly advances or delays balance adjustments based on cognitive demands.

Keywords: balance control, cognitive control, cognitive-motor interference, dual task, event-related

Transcutaneous auricular vagus nerve stimulation enhances stimulus-response binding effects

Monday, March 16, 11:00 - 12:30, C-Building - N16

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Action control relies on the automatic binding and retrieval of perceptual and motor features into so-called event files. Transcutaneous auricular vagus nerve stimulation (taVNS) is a non-invasive neurostimulation method that modulates neurotransmitter systems implicated in gain control, particularly the locus-coeruleus-noradrenaline and GABAergic systems. According to the gain control account, taVNS enhances neural signal-to-noise ratio, thereby amplifying the processing of task-relevant information. Building on this approach, we investigated whether taVNS alters the strength of stimulus-response (S-R) bindings. Healthy participants ($N = 69$) performed a stimulus-response binding task while receiving active or sham taVNS in a single-blind design. Behavioral indices of reaction times revealed significantly stronger S-R binding effects under active compared to sham stimulation, indicating enhanced integration and/or retrieval of event files. These findings provide evidence that taVNS can modulate core processes of action control, likely via gain-related modulation of perceptual and response feature weighting.

Keywords: Action control, stimulus-response binding, transcutaneous auricular vagus nerve stimulation, gain control

Competition for shared features causes interference: Evidence for code occupation in declarative and procedural working memory.

Monday, March 16, 16:30 - 18:00, HSZ - N8

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Working memory (WM) enables the manipulation of information necessary for goal-directed behavior. What limits WM capacity? Interference between representations has been identified as one factor, degrading WM representations, rendering them inaccessible. This study focuses on interference arising from “code occupation”. Code occupation denotes a process whereby a feature bound in one representation is temporarily occupied and therefore less available for binding to new representations. Accordingly, performance should worsen when items share features compared to when they do not, yielding partial overlap costs. Such costs are consistently observed for procedural WM representations, specifically representations of planned but not yet executed actions. Declarative WM, namely memory for items, typically does not exhibit partial overlap costs. This study investigates whether declarative WM is affected by code occupation. To this aim, we designed a closely matched paradigm to measure partial overlap costs in procedural (Exp. 1) versus declarative WM (Exps. 2 and 3). In Experiment 1 ($N = 60$), participants performed an action while holding another action plan in procedural WM. In Experiments 2 and 3 ($Ns=40$), participants memorized an item and performed a two-alternative forced-choice recognition test on it while holding another item in declarative WM. Across all experiments, we manipulated features overlap of the to-be-maintained action plans or items. We observed partial overlap costs in both procedural and declarative WM, indicating that code occupation also limits declarative WM capacity. This result speaks for shared mechanisms across WM systems.

Keywords: Declarative working memory, procedural working memory, code occupation, feature overwriting, feature binding

Is the bottleneck strategic or structural? A multilevel modeling approach to inter-person RT1 PRP effect variability

Monday, March 16, 16:30 - 18:00, HSZ - N8

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In dual-tasking, the cognitive capacity for task processing is limited, resulting in the well-researched psychological refractory period (PRP) effect, in which the response to the second of two tasks presented in quick succession is delayed more the less time there was between the stimulus presentations. This effect is often interpreted as evidence for serial processing where the processing of the second task can only start once the first task was successfully processed. Two types of theories make different claims about whether it is possible to process the second task while the first task is processed. The structural bottleneck theory states that cognitive capacity is distributed in an all-or-nothing manner while the capacity sharing theory states that cognitive capacity can be distributed gradually. Here we investigate these two hypotheses in three experiments ($N = 155$, $N = 183$, in data acquisition) that aim to manipulate the sharing factor, using spatially distinct congruency rates and different stimulus onset asynchrony frequencies. Because the capacity sharing theory allows for a strategic bottleneck to form dynamically, changes might only occur in parts of the population. We use a Bayesian multilevel modeling approach to distinguish interindividual variability in the 'true' effect sizes from measurement noise in order to identify whether there are individuals with an RT1 PRP effect. We derive immediate theoretical constraints from the model comparisons and discuss further implications.

Keywords: interindividual variability, psychological refractory period, dual-tasking, capacity sharing, bottleneck theory, multilevel modeling

Informing people about their knowledge gaps explicitly elicits curiosity

Monday, March 16, 16:30 - 18:00, HSZ - N8

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Curiosity theories converge in explaining curiosity as a function of people's knowledge gaps. However, they diverge in their predictions about the magnitude of these gaps that elicits peak curiosity. The novelty theory posits that curiosity is highest when knowledge gaps are large. The information-gap theory posits that curiosity peaks when knowledge gaps are moderate. Finally, the region of proximal learning theory posits that curiosity peaks when knowledge is almost complete, with just a small gap remaining. Here, we experimentally tested these theories by illustrating knowledge gaps to participants and measuring their subsequent information-seeking behavior. Across three experiments ($n = 200$ each), participants first completed a pretest assessing their prior knowledge about independent chapters on a topic. They were then randomly assigned to one of two conditions: an experimental group, in which knowledge gaps were explicitly illustrated, or a control group, in which they were not. Participants then decided whether to read or skip each chapter, for which their knowledge gaps were either illustrated or not. We found increased information-seeking behavior when illustrating large-to-moderate knowledge gaps compared to the control group. We found no evidence that illustrating small knowledge gaps increased information-seeking behavior. Critically, these effects were robust across time. Our findings provide converging evidence that making moderate-to-large knowledge gaps explicit elicits curiosity, reflected in higher information-seeking behavior. Together, these results support the novelty and information-gap theories, suggesting that curiosity arises when people detect a large-to-moderate knowledge gap.

Keywords: curiosity, information-gap theory, information-seeking, novelty theory, learning, motivation

When arithmetic gets complex: fNIRS evidence for fronto-parietal activation in multi-digit arithmetic

Monday, March 16, 16:30 - 18:00, HSZ - N8

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Arithmetic is represented in a fronto-parietal network. When the complexity in multi-digit arithmetic increases, the question arises whether primarily domain-general processing demands are increased, such as working memory in the frontal cortex, or also domain-specific processing demands, such as magnitude and place-value processing in the parietal cortex. This study addressed this question using functional near-infrared spectroscopy (fNIRS) to evaluate the neural correlates of multi-digit arithmetic in a written production paradigm. During fNIRS, adults (behavior: $N = 48$; fNIRS: $N = 46$) solved three-digit addition and subtraction problems with no, 1, or 2 carry or borrow operations, reflecting task complexity. At the behavioral level, complexity was reflected by reduced performance, i.e., lower accuracy and longer reaction times. At the neural level, fNIRS results revealed main effects of complexity in the bilateral fronto-parietal network of arithmetic processing, particularly in the bilateral inferior frontal gyrus (IFG), middle frontal gyrus (MFG), intraparietal sulcus (IPS), angular gyrus (AG), and supramarginal gyrus (SMG). Working memory differentially buffered complexity effects: larger verbal memory was linked to smaller accuracy costs and less frontal recruitment, whereas larger visuospatial memory was linked to less parietal recruitment. Together, these results show that the difficulty of multi-digit arithmetic relies on the bilateral fronto-parietal network, reflecting the joint contribution of domain-general and domain-specific processes.

Keywords: multi-digit arithmetic, carry effect, borrow effect, fNIRS, complexity, working memory, fronto-parietal network

Task, tier, type, token: testing a hierarchical framework for understanding multiple- and single-action representation

Monday, March 16, 16:30 - 18:00, C-Building - N16

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Local changes in action demands (e.g., due to an invalid cue) necessitate changes to pre-formulated action plans. Crucially, differential patterns of reaction-time costs associated with switches between distinct types of actions (e.g., single vs. dual) can shed light on the underlying cognitive representations. Here, we report on a series of experiments utilizing different types of stimuli in a precuing paradigm combining single actions, dual actions and no-go trials. In all studies, performance (expectedly) suffered when precue and signal were incongruent. Moreover, while there were dual-action costs in incongruent trials, congruent trials were associated with dual-action benefits. Depending on the type of stimulus, we also observed benefits for certain types of cue-to-signal changes: given a single stimulus lacking any dimensional overlap with the response (a colored circle), switching between single-left and single-right button presses (or vice versa) was faster than any other type of incongruency resolution. Given two separate, lateralized stimuli (geometric shapes) that spatially corresponded to the lateralized responses, on the other hand, direction-switch benefits in single-action trials were absent, but we measured no-go to dual-action switch benefits in dual-action trials. We believe that the combined findings of these experiments can be explained using a hierarchical model of action representation that is based on structured bundles of distinctive action features (the Task-Tier-Type-Token Framework).

Keywords: action representation, multiple-action control, multitasking, dual action, precuing, switching

Neither binding nor retrieval is affected by positive or negative affective content

Monday, March 16, 16:30 - 18:00, C-Building - N16

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Action control theories propose that responding to a stimulus leads to the binding of response and stimulus features into a common representation – a so-called event-file. Repeating any of its components leads to the retrieval of previous information, leading to so-called stimulus-response (S-R) binding effects. Previous research suggested that S-R binding is enhanced by positive compared to negative affect. However, other research found no such effect of affective modulations. We hypothesized that such a modulation might depend on the temporal aspect of presenting affective information. We asked participants to discriminate the shape of stimuli while orthogonally varying their color. In between stimuli we presented positive or negative images; in one block, the image was presented directly after prime offset, whereas in the other block, the image was presented immediately before probe onset. In a pre-registered, high-powered experiment ($N = 134$) we found no modulations of S-R binding effects by presenting positive or negative images. The results suggest that while valence might have an influence on overall performance, affective content does not affect the processes of binding and retrieval.

Keywords: Action control; Stimulus-response binding; Valence; Affective modulations

Time Limits Impact Everyday Problem-Solving Abilities in Adults of all Age Groups

Monday, March 16, 16:30 - 18:00, C-Building - N16

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Solving problems in everyday life is crucial to living independently. However, with older age, everyday problem-solving abilities decline, and there is an age-related slowing in processing speed. This age-related slowing has been proposed as a mechanism underlying general decline in cognitive abilities such as everyday problem-solving abilities. In this study, we investigated the impact of processing speed in the context of everyday problem-solving. Specifically, we tested whether limiting the time available to solve everyday problems impairs performance in older adults more than in younger adults. To do so, we used the EPT-14 (Reinhartz et al., under revision), a new 14-item version of the Everyday Problems Test (Willis & Marsiske, 1993). Test performance metrics of younger (18-39 years), middle-aged (40-59 years), and older (60-85 years) adults completing the EPT-14 either with ($n = 180$) or without ($n = 180$) a time limit were compared. Older adults showed lower everyday problem-solving abilities than younger and middle-aged adults, but there was no interaction between time limit condition and age group. Limited time during testing negatively impacted all ages to a similar degree. The results indicate that time constraints impact everyday problem-solving abilities in younger, middle-aged, and older adults equally, and do not result in an additional impairment regarding older adults' abilities to solve everyday life problems. Implications of these findings are discussed in the context of age-related decline, everyday problem-solving, and its assessment.

Keywords: Everyday Problem Solving, Processing Speed, Cognitive Decline, Time Limit, Adult Lifespan

The Challenges of Performing a Single Act: Determinants and Mechanisms of Co- Execution Errors in Multiple-Action Control

Monday, March 16, 16:30 - 18:00, C-Building - N16

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Complex behavior requires the control of various bodily effector systems (e.g., manual, oculomotor, vocal), both in isolation (i.e., single actions) or together (e.g., dual actions). Dual-task research has extensively documented performance costs when combining actions, making the implicit assumption that executing a single action is straightforward. We challenge this assumption by investigating scenarios in which multiple effector systems principally play a role but sometimes only one should be activated. Across multiple experiments participants switched unpredictably between executing a keypress only, a saccade-only, and both actions in response to left/right visual stimuli. The main findings comprised minimal or even absent dual-action RT costs and robust co-execution errors: prepared-but-irrelevant action systems spontaneously intruded when focusing on single responses. These errors showed a striking asymmetry: saccades intruded far more frequently in keypress-only trials than vice versa, revealing effector-specific differences in action prepotency and inhibitory control demands.

We identified several factors modulating this effect. First, effector intrusions increased after any trial involving that effector (regardless of direction), suggesting effector-system-level activation is carried forward across trials. Second, prolonging preparatory intervals between effector cues and directional stimuli decreased errors and speeded required responses, indicating proactive regulation of effector-system readiness. Third, errors diminished substantially with increasing task practice, alongside the emergence of typical coordination costs suggesting the segregation of action representations over time. Together, these findings reveal that single actions do not always come easy. When multiple action systems are prepared to potentially work together, using just one system alone may become surprisingly difficult.

Keywords: multiple-action control, dual-task performance, inhibitory control, eye movements

Do goal related attention effects hold under appropriate timing conditions?

Monday, March 16, 16:30 - 18:00, C-Building - N16

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Recent evidence suggests that attention is more likely allocated to stimuli related to currently prioritized goals (Vogt et al., 2011). Additionally, this prioritization of temporary goals can lead to attention being directed away from stimuli that signal threat in a dot-probe paradigm (Vogt et al., 2013). This is in stark contrast to the notion that attention is deployed to threatening stimuli as an automatic process thought to benefit evolutionary fitness (e.g. LeDoux, 1996). However, findings of this goal prioritization effect in attention are subject to some caveats. The main concern is that the cue-target onset asynchrony (CTOA) used in previous studies (350 ms or more) is considerably longer than what is typically employed in basic exogenous cueing experiments. In our study we therefore realized two timing conditions with a CTOA of 100 ms and 350 ms. A dot-probe paradigm was used with displays that pitted neutral, goal related, and threat related pictures against each other. Goal relatedness was induced by intermixed trials, where participants won points by reacting to a specific neutral picture deemed as the goal picture. We replicated findings from Vogt and colleagues, with goals being attentionally prioritized over threat and neutral. However no significant differences were found between timing conditions. This shows that the goal effect holds true, even under conditions better suited to basic attention research. Additionally, we observed, that threat pictures (competing with neutral pictures) produced a negative cueing effect so as if they tend to divert attention away from themselves, rather than attracting attention.

Keywords: attentional bias, spatial attention, cueing, goals, threat

Combining Attentional-Control Tasks May Lead to Higher Reliability and Correlations

Monday, March 16, 16:30 - 18:00, C-Building - N16

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Attentional control refers to the ability to maintain a goal and goal-relevant information in the face of distraction. Measures typically used to assess this ability have been shown to have low reliability and to correlate poorly with one another. Recently, however, higher reliability has been reported when two typical attentional-control tasks were combined in the same trial. This higher reliability was proposed to arise because combining tasks increases distraction, thereby increasing attentional-control variance (i.e., the signal) relative to noise. To capture the effect of the increased distraction, the attentional-control measure was computed as the difference between trials with the highest and the lowest distraction. Although this approach seems promising, there are a few concerns. First, the focus was on one task combination, thus questioning the generalizability of the approach. Second, correlations with other attentional-control tasks were not investigated. Third, the measure may have been affected by low-level learning (i.e. the learning of stimulus and/or response features). To address these concerns, we combined three attentional-control tasks pairwise and estimated reliability and correlations using hierarchical models. Moreover, we controlled for low-level learning by increasing the number of response alternatives and stimulus exemplars. Our results from 422 young adults showed increased reliability (signal-to-noise ratio .20–.25) and moderate correlations ($r = .38$ –.51) across all task combinations. Thus, combining tasks may be a first step to establish better measures of attentional control.

Keywords: attentional control, cognitive control, reliability, individual differences

Do we continuously predict during reading?

Tuesday, March 17, 09:00 - 10:30, HSZ - N8

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The complex pattern of eye movements during sentence reading has been computationally modeled using only three linguistic inputs, word length, frequency, and predictability. Whereas length can be easily computed and frequency can be obtained from databases, predictability is typically collected using the cloze task. Because this is labor-intensive and costly, cloze predictabilities are only available for a small set of texts. Recent developments in computational linguistics allow us to extract an alternative measure of predictability from open-weight large language models (LLMs), which are trained on next-token prediction. Thus predictabilities are now available for any text. Here we present evidence from lexical decision and eye movement experiments that LLM predictability strongly modulates ongoing cognitive word processing. Lexical decision times were substantially faster with high than with low predictability target words, and this was robust across variations in experimental procedure as well as in LLMs used to derive predictabilities. Given these findings, measures of word processing derived from eye movements should also be affected by LLM predictability. We evaluated this hypothesis using (a) a re-analysis of data from our longitudinal study of perceptual span development, for which predictability had previously not been available, and (b) designed experiments using the gaze-contingent boundary technique, in which we additionally tested whether predictability modulates semantic preview benefit. Results show that LLM predictability robustly influences gaze-based measures. Use of predictability increases with reading skill, has strong effects on early eye movement measures such as word skipping and first fixation duration, and increases interacts with semantic preview benefit

Keywords: reading, eye movements, predictive processing, LLMs

Single words are no exception: Reading is impaired when text is presented in uppercase rather than lowercase, independent of text length

Tuesday, March 17, 09:00 - 10:30, HSZ - N8

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There is substantial evidence that extended text written entirely in uppercase letters is read more slowly than text in lowercase. Interestingly, it has been proposed that this uppercase disadvantage applies only to extended text, whereas single words may actually be processed more efficiently in uppercase than in lowercase. Consequently, the use of uppercase letters has been recommended for display labeling where only single words are required. However, it is not obvious why the well-documented uppercase disadvantage for extended text should be reversed for single words. To examine this issue, we conducted three large-sample experiments (total $N = 1065$) in which participants read news headlines and single words presented either in lowercase or uppercase under a range of conditions. Across all experiments, a robust and consistent uppercase disadvantage for both news headlines and single words was observed. These findings challenge the view that presenting single words in uppercase facilitates the processing of these words and suggest that the mechanisms underlying the uppercase disadvantage in extended text also affect the processing of single words. Earlier recommendations to use uppercase for single-word display labels should be reconsidered.

Keywords: reading, legibility, typography, display design

Evaluating text: The interplay of actual text quality, advance text information, and reader mood

Tuesday, March 17, 09:00 - 10:30, HSZ - N8

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Every day, people read all kinds of texts differing in content, quality, etc. While there is abundant research on factors affecting text comprehension, little research has examined factors influencing overall text evaluation. To address this gap, we conducted a between-subjects experiment ($n = 174$) testing the role of three factors. First, we manipulated actual text quality (high vs low). Obviously, texts of high (vs. low) quality should typically be judged more favorably. However, the degree to which text quality is discerned by readers may depend on numerous factors. To this effect, we tested the role of one factor pertaining to the reader and one factor pertaining to the context of reading. Specifically, we manipulated readers' mood (positive vs. negative) as well as the valence of advance information about the quality of the text (positive vs. negative). Results showed more positive evaluations for high (vs. low) actual text quality, for positive (vs. negative) advance information, and for positive (vs. negative) mood. Moreover, consistent with predictions derived from a mood-congruent expectancies approach (Ziegler, 2014), a three-way interaction revealed that the effect of actual quality on text evaluation was stronger when the valence of advance information was incongruent (vs. congruent) with the valence of mood (e.g. positive advance information under negative mood). In congruent conditions, more positive evaluations were found given positive mood—positive advance information as compared to negative mood—negative advance information. Implications for theories of affective influences on information processing and for understanding how readers form global text judgments are discussed.

Keywords: text evaluation, text quality, advance information, mood, mood-congruent expectancies, affective influences on information processing

Testing the limits of cumulative semantic interference in word production: Implications for adaptive models

Tuesday, March 17, 09:00 - 10:30, HSZ - N8

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It was repeatedly found that when speakers produced a word, such as “lion”, they were slowed by a constant amount of time for each previously produced word from the same semantic category, for example the words “elephant” or “zebra”. That is, there was a linear relationship between the ordinal position of a category exemplar in the experimental list and the naming latency. This cumulative semantic interference effect observed in the context of the continuous picture naming task is the main motivation for adaptive models of word production. Notably, all studies reporting this effect have examined the interference only across five (or six in one case) ordinal positions. We investigated whether this linear increase would continue when testing more ordinal positions – namely, ten or fifteen. Inconsistent with the predictions of current adaptive models, but consistent with evidence from the learning literature, we found that the increase in the interference was restricted. Additionally, we found that the interference decreased with a long lag (introducing unrelated naming episodes) and that its developmental trajectory was similar before and after the lag. These findings require an adjustment to existing adaptive models of word production.

Keywords: word production, adaptive models, semantic interference, continuous naming, psycholinguistics

Investigating Cognitive Conflict and Semantic Processing in Newly Learned Languages Using the Stroop Task

Tuesday, March 17, 09:00 - 10:30, HSZ - N8

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The Stroop task examines our ability to act in a goal-directed manner while ignoring irrelevant aspects of a stimulus, typically inducing cognitive conflict through semantic processing. Theories of bilingual processing and conflict monitoring suggest that semantic access and conflict resolution depend on language proficiency and context. Newly learned languages are thought to lack direct semantic access and thus elicit little cognitive conflict compared to a dominant language. This study investigated cognitive control during early language learning, testing whether newly acquired words in an unfamiliar language produce Stroop conflict and how control adapts across language contexts. Participants learned color words in a novel language and then completed a vocal Stroop task. Results showed that once a stimulus is semantically encoded, it can trigger interference. Interference decreased when stimulus and response languages were mismatched. Importantly, responding in the newly learned language still produced conflict, indicating engagement of similar cognitive control mechanisms as in the dominant language. While the dominant language operated with high automaticity, the newly learned language required greater effort, including translation processes. These findings reveal dynamic, context-sensitive semantic access. Even minimal training can establish functional semantic representations sufficient to engage cognitive control similarly to well-known stimuli. In the context of language learning, this challenges the idea that early bilinguals experience strictly delayed semantic access.

Keywords: Stroop task, Cognitive control, Novel language, Semantic access

Valence Sound Symbolism: Understanding the Association between Vowels and Valence using an Implicit Paradigm

Tuesday, March 17, 09:00 - 10:30, HSZ - N8

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The association between vowels and valence is known as valence sound symbolism. For example, the vowel /i/ (as in English "meet") is more associated with positive valence than the vowel /o/ (as in French "rose"), and this phenomenon has been extensively studied using explicit and deliberate methods. This study investigates valence sound symbolism through an implicit paradigm adapted from Vainio (2021). The aim is to determine whether valence sound symbolism, like size and shape sound symbolism, operates automatically. Participants ($N = 42$) classified valenced facial expressions by articulating the target vowels. Specifically, in the congruent blocks, participants were instructed to say /i/ for happy and /o/ for angry faces, and in the incongruent blocks, to say /i/ for angry and /o/ for happy faces. We found significantly faster response times in congruent blocks than in the incongruent blocks. The analysis of acoustic parameters, particularly the fundamental frequency (f_0), revealed a significant interaction between congruency and vowel type. Specifically, /i/ was pronounced with higher pitch in the congruent (happy face) than in the incongruent blocks (angry face), whereas /o/ showed the opposite pattern, with higher pitch in the incongruent (happy face) than in the congruent blocks (angry face), indicating that participants' pitch was modulated by the match or mismatch between the vowels and the valence of the faces. In sum, the present results indicate that the association between vowels and valence operates automatically, thereby contributing to our knowledge of cognitive processing during valence sound symbolism.

Keywords: congruency, sound symbolism, valence, automaticity, iconicity

Challenging the Validity of Attentional-Control Tasks: Evidence for Low Criterion Validity

Tuesday, March 17, 09:00 - 10:30, C-Building - N16

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Attentional control – also called executive functions or cognitive control – refers to our ability to maintain and implement a goal and goal-relevant information in the face of distraction. Previous research has provided limited evidence for a good measurement of attentional control. That is, in addition to low reliability, measures of typical attentional-control tasks have been shown to correlate poorly with one another. This challenges the convergent validity of attentional control, questioning to what extent these tasks assess the same underlying construct. However, assessing the validity of attentional-control tasks requires considering not only convergent validity but also criterion validity (i.e., the extent to which a measure correlates with an outcome variable). The purpose of the present study was to test the criterion validity of typical attentional-control measures. Specifically, we aimed to determine whether the typical attentional-control measures can predict academic achievement in adults. To this end, students were asked to perform several attentional-control tasks (e.g., color Stroop, number Stroop, letter flanker, and Simon tasks, and a task-switching paradigm). The typical measure of each task was then related to students' university grades. Preliminary results showed reliability estimates ranging from .50 to .72 for most tasks. However, across all tasks, the correlations with the grades were low, ranging from -.10 to .10 ($N = 175$). These results suggest low criterion validity for typical attentional-control measures. Thus, the criterion validity cannot be used to identify a task that could serve as a starting point for developing better measures of attentional control.

Keywords: cognitive control, inhibition, executive functions, measurement

Within- and Between-Task Transfer of Item-Reward Associations in Conflict Tasks

Tuesday, March 17, 09:00 - 10:30, C-Building - N16

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Reward associations can shape attentional priorities, but the conditions under which such learning persists and generalizes remain unclear. We examined how learned item-reward associations influence behavior within (Experiment 1) and between (Experiment 2) conflict tasks when rewards are removed. In both experiments, participants performed a color-word Stroop task, responding to the color while ignoring the word. Certain colors were associated with high (90%) or low (10%) reward probability. In Experiment 1, we compared learning with explicit pre-cues signaling reward availability to learning through feedback alone. Both groups responded faster to high-reward colors, and the pre-cued group additionally showed enhanced focus (reduced Stroop effect) on reward trials. However, a critical dissociation emerged once rewards were removed: only participants who learned without pre-cues maintained their performance advantage for previously high-reward colors. Thus, explicit pre-cues promote immediate, context-dependent control, whereas learning without pre-cues fosters durable, automatic attentional biases that persist beyond training. Experiment 2 tested whether item-reward associations transfer across tasks. After Stroop training without pre-cues, participants completed a color flanker task (responding to the center circle's color while ignoring outer circles), which shared perceptual features (colors) with the Stroop task but involved no rewards. Despite changes in task structure, stimuli, and conflict type, participants continued responding faster to previously high-reward colors. These findings reveal that item-reward associations can produce lasting, transferable effects on attention, highlighting a mechanism through which reward shapes attention and behavior in conflict tasks beyond the immediate training context.

Keywords: cognitive control, attention, reward, transfer

Cognitive Aging and Multitasking Strategies: Old Habits or New Tactics in Preferred Processing Modes and Response Strategies

Tuesday, March 17, 09:00 - 10:30, C-Building - N16

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Traditional research emphasizes the costs of multitasking; however, recent work highlights robust individual differences in how people organize multiple tasks, shaped by their preferred processing modes and response strategies. Using the Task-Switching-with-Preview (TSWP) paradigm, we identified whether individuals preferred an overlapping (parallel) or serial processing mode. In TSWP, participants complete three trials of Task A (or B) while previewing the upcoming stimulus for Task B (or A) before switching tasks. Some individuals use this preview to prepare and switch rapidly (parallel mode), whereas others complete tasks sequentially without using preview information (serial mode). Response strategies were probed using the Free-Concurrent-Dual-Tasking (FCDT) paradigm, where both tasks are also presented concurrently but participants freely choose when to switch. Individuals typically adopt either a blocking (>10 task repetitions) or interleaving strategy (frequent switching). To examine how these preferences unfold across the adult lifespan, we compared younger ($N = 72$) and older adults ($N = 70$) in an online sample. Given age-related declines in working memory, executive control and divided attention, we anticipated a higher prevalence of serial processing in the TSWP and blocking strategies in the FCDT among older adults. If preferences remain stable with age, older adults who prefer overlapping or interleaving were expected to show an age-related decline in multitasking efficiency. Our findings indicate adaptation at the level of processing modes but stability at the level of response strategies: older adults showed significantly more serial processing, whereas strategy distributions were comparable across age groups, though older adults were less efficient.

Keywords: task-switching, aging, individual differences, task processing, response strategies

Cross-modal training of task-switching: Evidence for stimulus-specific rather than category-level amodal improvements after auditory training

Tuesday, March 17, 09:00 - 10:30, C-Building - N16

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When people alternate between two tasks, substantial switch and mixing costs arise, yet these costs can be reduced through training. Previous work has shown that auditory task-switching training can induce cross-modal transfer to an analogous visual task-switching situation, suggesting that training-related improvements can operate at an amodal process level. However, because earlier studies used identical semantic stimulus content and responses on the auditory training and visual transfer tasks, it remains unclear whether the amodal training-related improvements arise at the stimulus level or at a more abstract category level. To address this question, participants completed three sessions of auditory task-switching training involving two semantic-categorization tasks with spoken words (experimental group). Two control groups received either single-task or no training. In pre- and post-training sessions participants performed both, the trained auditory and untrained visual task-switching situation. The visual tasks included the same semantic-categorization tasks as the auditory condition but with new additionally presented category members. The results revealed reduced auditory switch (but not mixing) costs for participants in the experimental group relative to both control groups, indicating successful training-related improvement of task-switching. However, we found no group-specific improvements for the visual transfer tasks when new category members were used. This lack of transfer suggests that previously reported cross-modal training benefits in task-switching arose from the reuse of identical semantic content. Consequently, this pattern supports the assumption that cross-modal transfer is limited to situations in which trained and transfer tasks overlap at the stimulus level, thereby reflecting stimulus-specific rather than category-based learning.

Keywords: cognitive training, auditory task-switching, cross-modal transfer, stimulus-specific learning

Examining affective flexibility using self-organized task switching: Evidence for an emotional escape mechanism

Tuesday, March 17, 09:00 - 10:30, C-Building - N16

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We introduce a novel affective Voluntary Task-Switching paradigm to explore the influence of emotional content on voluntary task choice and task performance. On each trial, participants were presented with facial stimuli differing by gender, age or emotion, and freely choose which task to execute. Voluntary task switches were required in two distinct contexts: An Emotion -Relevant context (participants switch between the emotion vs. gender judgment) and an Emotion -Irrelevant context (age vs. gender judgment with emotional distractors). To encourage task switching, we presented separate faces for each task and introduced waiting times for the respective task repetition stimulus, whereby the waiting times increased with the number of consecutive task repetitions. Like expected participants responded slower in task switch compared to task repetition trials and task switch rates correlate with these switch costs. Importantly, the emotional content of the stimuli impacted differently on task decision and performance depending on its relevance. In the Emotion Relevant context, participants switched more frequently after performing the emotional rather than the neutral task. In the Emotion Irrelevant context, participants switched more frequently after encountering an emotional rather than neutral stimulus as distractor. Further, participants responded faster to emotional stimuli in the emotion task, while task performance was decreased when for emotional stimuli in the gender task in the Emotion Relevant context and in both tasks in the Emotion irrelevant context. Taken together, these findings indicate an “emotional escape mechanism” in line with automatic attentional capture due to emotional stimuli.

Keywords: voluntary task switching, emotional escape

One Structure, Many Paths: A Stable Three-Factor Model and Asynchronous Growth of Executive Control from Early to Late Adolescence

Tuesday, March 17, 09:00 - 10:30, C-Building - N16

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Key components of executive control undergo significant changes during adolescence, yet its structure and development growth remain under debate. Using behavioral tasks and self-report measures of the three key components working memory (WM), cognitive flexibility (CF), and inhibition, we examined the factor structure of executive control and its age-related changes in a cross-sectional sample of 175 adolescents (age range=9–18 years). Confirmatory Factor Analysis (CFA) results indicated that a three-factor model (WM, CF, Inhibition) provided a better fit to the data than a unitary model. To evaluate age-invariance, we split the sample at the median (younger: $n = 88$; older: $n = 87$). Factor structure and loadings did not differ across age groups, suggesting that the latent structure is comparable for younger and older adolescents. Using generalized additive models, we observed distinct, non-linear developmental trajectories. WM showed its most rapid improvement in early adolescence, while the fastest growth in CF and state inhibition happened during mid-adolescence. Our results also revealed a clear difference between state and trait measures of inhibition; task-based (state) inhibition improved with age, while self-reported (trait) inhibition remained stable across the sample. These findings suggest that while the core structure of executive control is stable throughout adolescence, its key components mature at different paces. In sum, the evidence reflects and extends dual-systems models by emphasizing the multicomponent nature of the cognitive control system and highlights the importance of distinguishing between state and trait measures to understand adolescent development.

Keywords: Executive control, Adolescence, Dual-Systems Models, Factor Structure, State and Trait Measures

Dimming the mind's eye: metacognitive control over mental imagery

Tuesday, March 17, 16:30 - 18:00, HSZ - N8

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Vivid mental imagery is a strength but also has its downsides (Knauff et al., 2002). Especially patients with trauma-related disorders suffer from distressing visual memories often experienced as uncontrollable (Brewin et al., 2010). Under which conditions can people voluntarily control the vividness of their mental images? Using congruency effects between imagery and perception as an objective measure of vividness, Cochrane et al. (2021) showed that healthy humans can intentionally control how vividly they generate mental images of colored shapes. Yet, it remains unclear whether already present mental images can be voluntarily downregulated. To investigate this, we are planning a behavioral experiment adapting Cochrane et al.'s paradigm. Twenty-eight healthy adults will perform pair sequences of visual pop-out search tasks. Between the tasks, participants will be asked to vividly imagine a shape in the previous distractor color. In half of the trials, an auditory cue will then instruct them to “dim” the mental image during the interval, while in the control trials, the cue indicates to keep it up. We expect faster search times if the target color is congruent to the previously imagined color. Most importantly, we expect this effect to be smaller in “dimmed” compared to vivid-imagery trials, indicating that the vividness of the mental image can be intentionally reduced. We further expect practice effects, and that objective imagery effects align with subjective vividness ratings. Exploratorily, we will assess individual imagery control strategies. The results are meant as a pilot study for following experiments in trauma patients.

Keywords: mental imagery, metacognition, metacognitive control, intertrial priming

Assessing Discrepancies between Expected and Experienced Subjective Workload in University Courses Using the NASA-TLX

Tuesday, March 17, 16:30 - 18:00, HSZ - N8

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Accurate assessment of student workload is vital for competence-oriented higher education and fair ECTS allocation. Yet, standard estimates based on average working hours overlook students' subjective workload experience. This preregistered study adapts the multidimensional NASA Task Load Index for university courses to examine how workload expectations at term start and experienced workload judged at term end predict course evaluations, objective learning goal achievement (course grade), perceived ECTS appropriateness, and global study satisfaction. Both students and their lecturers independently assess the subjective workload of their university courses at term start (T1, expected) and at term end (T2, experienced). Our planned analyses (Bayesian linear mixed models) focus in particular on expectation-experience discrepancies between students' subjective workload judgements at term start and end as well as between student and lecturer assessments. We hypothesize that discrepancies in subjective workload expectations and/or experiences negatively impact on course evaluations and ECTS appropriateness ratings, predict lower learning goal achievement (worse course grades), and lead to reduced global study satisfaction. The study integrates multi-informant subjective workload measures and outcome measures to derive evidence-based recommendations for ECTS allocation, course design, and instructor–student workload communication.

Keywords: NASA TLX, subjective workload, expectation–experience discrepancy, university course evaluation, academic achievement, study satisfaction

From Cues to Consequences: Do Social Goals Gate the Influence of Anticipated Affective Outcomes on Approach-Avoidance Tendencies?

Tuesday, March 17, 16:30 - 18:00, HSZ - N8

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Approach-avoidance responses are known to be influenced by the affective features of the stimuli cueing the response. Our preliminary work examined whether this influence extends to the predicted affective outcomes in a social context. In an initial experiment, performance was indeed facilitated when affective responses were followed by compatible outcomes (e.g., approach leading to a smile). However, when affective response cues were introduced and made relevant for the task goal (i.e., giving accurate approach/avoidance responses to smiling or angry expressions), the impact of outcome anticipation diminished. This raises the question of whether affective outcomes regain their influence when they are made relevant to a goal of comparable motivational significance. The following study will test this hypothesis by embedding a context in which affective outcomes function as social feedback, thereby linking them to a social goal: gaining positive evaluations from others. To create a goal that is motivationally comparable to the task goal, two manipulations will be introduced. First, the response-outcome contingency will be made probabilistic, so that desired outcomes become uncertain but anticipatable. Second, participants will be told that the outcomes reflect evaluative judgments based partly on their personality, rendering the outcomes personally relevant and diagnostic of success for the social goal. This design enables us to investigate how affective cues and anticipated social outcomes compete or combine to guide approach-avoidance. Response times and facial electromyography will be used to capture automatic tendencies across conditions.

Keywords: approach-avoidance, outcome anticipation, emotional action, facial electromyography

On the garden path? - An eye-tracking study on reading comprehension in adults with ADHD

Tuesday, March 17, 11:00 - 12:30, HSZ - N8

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Individuals with Attention-Deficit/Hyperactivity Disorder (ADHD) often show impairments in cognitive inhibition, which may affect their ability to suppress incorrect initial interpretations during sentence comprehension. However, little is known about how these inhibitory difficulties shape online syntactic processing, particularly when readers encounter temporarily ambiguous Garden-Path structures. This preregistered eye-tracking experiment investigates these mechanisms in adults with clinically verified ADHD. In a 2×2 mixed design, $N = 100$ participants (50 ADHD, 50 controls) read validated German Garden-Path sentences containing genitive or dative ambiguities (Van Kampen, 2001), along with non-ambiguous counterparts and 24 fillers. Participants read self-paced while high-resolution eye movements were recorded. Two key dependent measures were collected: (a) total reading time per sentence as an index of syntactic integration difficulty, and (b) reanalysis processes quantified as regression-related saccades per second, standardized by reading duration. Based on theoretical accounts of reduced inhibitory control in ADHD, we hypothesized longer reading times and increased regression behavior for ambiguous sentences in the ADHD group relative to controls. Data collection has been completed, and statistical analyses are currently being performed. This study aims to provide further insights into the cognitive mechanisms underlying sentence comprehension in ADHD.

Keywords: ADHD, Syntactic processing, Garden-Path sentences, Eye-tracking, reading comprehension

No Evidence for Memory Effects of Vowel–Valence Associations

Tuesday, March 17, 11:00 - 12:30, HSZ - N8

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Vowels are associated with affective valence, with /i/ (as in tree) typically associated with positive valence and /o/ (as in the German word Tor [gate]) with negative valence. Although such iconic vowel–valence associations have been observed across languages and methodological approaches, it remains unclear to what extent they operate automatically and whether such automaticity could ease processing in ways that benefit memory encoding and subsequent recall. In three preregistered experiments (total $N = 433$), we tested whether iconic vowel–valence associations would enhance memory performance, which would suggest an automatic rather than explicit processing route. Specifically, we examined whether congruent pseudoname–face pairings (i.e., /i/-names with positive faces; /o/-names with negative faces) would be recalled more accurately than incongruent pairings. Participants were instructed to memorize both types of pairings and, after a brief retention interval, were asked to match each previously seen face to its corresponding pseudoname. None of the experiments showed an effect of vowel–valence congruency on recall performance. Pooled analyses consistently showed no recall advantage for congruent pairings, suggesting that iconic vowel–valence associations do not substantially influence memory performance.

Keywords: valence sound symbolism, iconicity, language, vowels, memory

When it's hard to find the right words: leveraging meaning-form systematicity to create novel words with a predefined meaning

Tuesday, March 17, 11:00 - 12:30, HSZ - N8

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In everyday communication human beings rely on linguistic regularities to answer the semasiological question “what does the word X mean?”. Yet, we also need the opposite, that is answering the onomasiological question “how do I express the concept X?”. In this study, we explored whether widespread systematicity between form and meaning estimated through Linear Discriminative Learning can be leveraged to generate novel words from predefined semantic information. We conducted three experiments to explore whether human participants were able to identify a generated pseudoword resulting from one single word prompt (i.e., a “pseudo-synonym”, Experiment 1), a pair of word prompts whose combined meaning produced a certain pseudoword (Experiment 2), and a generated pseudoword resulting from the combined meaning of a pair of word prompts (Experiment 3).

Participants proved to be able to identify the correct pseudoword(s)-prompt(s) association, and semantic similarity between response options proved to explain human performance over and above surface similarity. These results suggest that regularities between form and meaning not only support language comprehension but also play a role in the formulation of novel ideas in speech production. Mappings from a semantic space to a form space provide a new tool for simulating the production of (and actually generating) novel terms.

Keywords: semantic pseudoword creator, linear discriminative learning, discriminative lexicon, semantics, meaning-to-form mapping, systematicity, novel words

Grammatical gender processing in Spanish and German: A dual-route account of orthographic regularities

Tuesday, March 17, 11:00 - 12:30, HSZ - N8

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The distribution of orthographic patterns regarding noun gender varies cross-linguistically. Spanish has two informative endings: “-a” (feminine) and “-o” (masculine). German, however, has a less transparent gender system with complex orthographic cues and many exceptions. To explain the retrieval of gender from long-term memory, recent accounts propose a dual-route framework in which gender can be accessed via whole-word memory or via sub-lexical orthographic cues (Sá-Leite & Lago, 2024). The effectiveness of the sub-lexical route depends on cue predictiveness (i.e., frequency and consistency of the cues), so that transparent systems like Spanish should rely more on orthography to process gender than opaque systems such as German. We tested this prediction using gender categorization tasks. Native Spanish and German speakers judged whether written nouns were masculine or feminine. Nouns were transparent (highly predictive cues), regular (typical but less predictive), or opaque (no cues). Results indicated that Spanish speakers had speed and accuracy advantages for transparent and regular nouns, whereas German speakers had a speed advantage only for transparent nouns, with accuracy remaining unaffected by transparency. Considering that the “regular” category included more cues in German than in Spanish (reflecting the languages’ realities), gender retrieval appears cognitively similar across languages, differing mainly in the extent to which the sub-lexical route is used. These findings support dual-route models based on different-strength links: reliable orthographic cues support gender categorization via sub-lexical processing, whereas opaque nouns rely on whole-word representations; yet, as in German, greater gender-system complexity reduces the overall contribution of the sub-lexical route.

Keywords: visual word recognition, cross-linguistic comparison, dual-route models, gender transparency, grammatical gender

Judgments of Learning in Humans and LLMs: Evidence from a Cross-Agent Model

Tuesday, March 17, 11:00 - 12:30, HSZ - N8

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Large language models (LLMs) increasingly exhibit human-like performance across a wide range of psychological tasks in which they are tested as experimental subjects. However, their capacity for metacognition—the ability to monitor and evaluate cognitive processes—has not yet been systematically compared to that of humans. In this study, participants and three LLMs (GPT-3.5-turbo, GPT-4-turbo, GPT-4o) were presented with sentence pairs comprising one garden-path sentence, which is known to be syntactically misleading and requiring reanalysis, preceded by either a fitting or an unfitting contextual sentence. By manipulating the contextual fit, we assessed how semantic relatedness influenced judgments of learning (JOL) for both humans and the models. Results showed that human JOLs were reliably sensitive to contextual cues and accurately predicted subsequent memory performance, whereas none of the LLMs demonstrated comparable sensitivity or predictive accuracy and thus failed to anticipate human memory performance. These findings reveal a fundamental gap between object-level processing and meta-level monitoring in artificial systems, suggesting that enhancing self-monitoring mechanisms of such models could advance their applications in education, personalized learning, and adaptive human-AI collaboration. More broadly, we introduce a cross-agent prediction model—where humans predict their own recognition performance and LLMs predict human recognition outcomes—as a framework for benchmarking (meta-)cognitive alignment between humans and artificial agents.

Keywords: Generative artificial intelligence, Metacognition, Cross-agent prediction, Garden-path sentences

What switch costs between joint and individual action reveal about the structure of task representations

Tuesday, March 17, 11:00 - 12:30, HSZ - N8

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A central debate in joint action research concerns what distinguishes joint action from individual action. Recent accounts propose that specific task representations support joint action. While initial experimental evidence supports this claim, it remains unclear how the representations that support joint and individual action are integrated with one another. Here, we introduce an experimental paradigm that applies the logic of task-switching to examine whether joint and individual action rely on distinct or shared task representations. Across two experiments with independent samples ($N = 24$ each), participants were cued to press a key either individually or jointly with a partner. Crucially, the only difference between conditions was the instruction to act alone or together. By comparing response times in repetition and switch trials, we tested whether alternating between these types of actions incurred a switch cost. One possibility is that joint and individual action rely on separate representations, such that switching between them incurs a switch cost. Alternatively, both may draw on a shared representation that can be fully or partially instantiated such that no switch cost should emerge. Our results revealed significant switch costs, consistent with the proposal that joint and individual action depend on distinct task representations. Importantly, switch costs were larger when switching towards joint action than towards individual action, suggesting that the task representations supporting joint action may function as a dominant mode of representation that must be inhibited when acting alone.

Keywords: social cognition, joint action, task switching, task representations

Context-Specific Proportion Switch Effects in Stable and Volatile Environments: The Selective Influence of Context Change Trials

Tuesday, March 17, 11:00 - 12:30, C-Building - N16

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The context-specific proportion switch (CSPS) effect refers to the modulation of switch costs by the frequency of switch trials within a given context, with larger switch costs in mostly repetition than in mostly switch contexts. Research on the analogous context-specific proportion congruency (CSPC) effect has shown that the extent of this context-specific adaptation depends on the volatility of context changes: the CSPC effect was stronger in a blocked manipulation with a single context change than in a random trial-by-trial manipulation, where stimuli appeared unpredictably across contexts (Fischer et al., 2014). In two studies, we examined whether a similar difference between blocked and random conditions would also emerge for the CSPS effect. Results revealed a typical CSPS effect in the blocked condition but a descriptively reversed effect in the random condition. Unlike conflict, which depends on the congruency of the current trial, task switching relies on a sequential reference to the previous trial to determine switches or repetitions. This dependency becomes critical when the volatility of the context changes increases: the reference stems from the previous context, while the current trial requires adaptation to the other context. Post hoc analyses excluding context-switch trials suggest that adaptation is not fully established on the first trial after a change, potentially explaining the reversed CSPS pattern in the random condition. Overall, these findings suggest that the CSPS effect is selectively influenced by both the volatility of context changes and sequential reference, which must be resolved before effective adaptation to a context change can occur.

Keywords: cognitive control, control adaptation, proportion congruency, context change, task switching

Task demands determine the stimulus-hand proximity effect by selectively modulating distractor processing

Tuesday, March 17, 11:00 - 12:30, C-Building - N16

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Placing the hands near the stimuli have been shown to modulate interference effects in conflict tasks. Liepelt and Fischer (2016) observed that the direction of this near-hand effect depends on the task demands. In a number-categorization Simon task, conflict was reduced in the proximal compared to the distal stimulus-hand condition, while the reverse pattern was true for a less complex color-discrimination Simon task. The authors explained the different directions of this stimulus-hand proximity effect by a flexible attentional weighting of bottom-up versus top-down signals depending on task demands. The present study aimed to test this hypothesis by fitting the data of Liepelt and Fischer (2016) to the Diffusion Model for Conflict (DMC). DMC assumes that stimulus-response translation in conflict tasks involves two overlapping diffusion processes, consisting of automatic distractor-based activation and controlled target-based activation. Across two experiments, model fits showed that stimulus-hand proximity selectively modulated distractor-based activation strength, while other processing components were largely unaffected by the stimulus-hand proximity. Most importantly, the direction of this modulation mirrored the opposing behavioral effects observed in the Simon tasks of the original study: stronger spatial distractor-based activation in the stimulus-hand proximal compared to the stimulus-hand distal condition in the color-discrimination task, but weaker activation in the stimulus-hand proximal compared to the stimulus-hand distal condition in the number-categorization task. These results support the idea that stimulus-hand proximity selectively modulates distractor processing depending on task demands.

Keywords: Embodied Cognition, Near-hand effect, Simon effect, Process models, Diffusion Model for Conflict, Peripersonal Space, Conflict processing

How does mind wandering influence dual-task performance?

Tuesday, March 17, 11:00 - 12:30, C-Building - N16

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Mind wandering refers to engaging in task-unrelated thoughts and takes place almost 50% of the time (Killingsworth & Gilbert, 2010). Consequently, performance in the main task, like sensory information processing (Smallwood et al., 2008), is impaired. In the present study, we investigated whether these attentive lapses may also influence parameters of dual-task performance, e.g., between-task interference (backward-crosstalk) and multitasking efficiency when performing two visual-manual number categorization tasks. Dual-task trials were interspersed by random thought probes requiring participants to rate their focus of attention prior to the probe as on or off task using two different rating metrics in Experiment 1 ($N = 39$) and in Experiment 2 ($N = 40$). To examine whether probes of increased mind wandering affected the backward-crosstalk effect (BCE), we restricted the analysis to the last four trials before every thought probe. Results revealed that mind wandering grew larger across the experiment and affected overall performance, i.e., reaction times and accuracy, but did not influence the BCE in both experiments. In a second analysis, we investigated effects of mind wandering on the dual-task efficiency marker Time on Task (ToT, Reissland & Manzey, 2016). Indeed, ToT was longer for trials accompanied by higher mind wandering in both experiments. These results suggest that attentive lapses due to mind wandering appear to selectively reduce the overall efficiency of performing two tasks while leaving between-task interference unaffected.

Keywords: cognitive control, BCE, mind wandering, ToT

An (Un)Confident Look into the Future – Confidence Scales Anticipatory Saccades Towards Expected Action Outcomes

Tuesday, March 17, 11:00 - 12:30, C-Building - N16

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When actions contingently yield specific effects, bi-directional action-effect associations are formed. According to ideomotor theories of action control, these bi-directional action-effect associations allow us to select appropriate actions based on anticipated, desired effects. Furthermore, the anticipation of future effects leads to anticipatory saccades towards their expected, future location, reflecting a proactive effect monitoring process. Such anticipatory saccades have consistently been shown in very predictable action-effect contexts. Here, we investigated whether anticipatory saccades can also be observed in a more volatile setting in which participants are relatively uncertain about the correctness of their response and, correspondingly, about the to-be-expected effect. Using a (supposed) perceptual discrimination task, we systematically either frequently presented correct feedback or frequently presented incorrect feedback in different phases of the experiment to induce corresponding response accuracy expectations. Furthermore, on 25% of the trials, participants additionally rated their confidence in having answered correctly/incorrectly before being presented with the effect. Overall, we observed relatively few anticipatory saccades in this volatile setting. Importantly, however, anticipatory saccades scaled with participants' confidence ratings, indicating that uncertainty is accounted for in proactive effect monitoring on a single-trial level.

Keywords: action control, action effects, anticipation, eye tracking, uncertainty, confidence

Improving task-order coordination through training of stimulus-order monitoring

Tuesday, March 17, 11:00 - 12:30, C-Building - N16

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Effective performance in dual-task (DT) situations requires coordinating the temporal order of two task streams. While prior research has shown that practice can reduce DT interference, it remains unclear which specific subprocesses of task-order coordination are trainable and how improvements generalize beyond trained stimuli. The present study investigated whether monitoring the temporal order of incoming stimuli constitutes a separable, trainable component of task-order coordination, and how its improvement contributes to broader DT training gains. Participants completed one of four training regimens: random-order DT training, mixed single-task (ST) training selectively targeting stimulus-order monitoring, fixed-order DT training, or pure ST training. Pre- and post-tests assessed coordination costs in random-order and fixed-order DT blocks, along with transfer to tasks involving untrained stimuli. Both experimental regimens—random-order DT and mixed ST training—produced significant reductions in coordination costs compared to control conditions, demonstrating that monitoring the stimulus order is a trainable subprocess that contributes to coordination improvements. Although frequentist analyses showed comparable training benefits within the trained context, Bayesian analyses and transfer results revealed important differences in generalization: random-order DT training yielded robust transfer to novel stimuli, whereas mixed ST training produced weaker but reliable transfer effects. This pattern suggests that while monitoring is necessary for effective coordination, broader generalization requires its integration with additional mechanisms such as updating, sequencing, and scheduling. Together, the findings support a modular account of DT coordination in which monitoring forms a foundational component, but robust and generalizable coordination skills emerge only when monitoring is embedded within the broader coordination process.

Keywords: dual-task, task-order coordination, cognitive training, skill acquisition, transfer, stimulus-order monitoring

An attempt to replicate action-effect learning and its generalization without stimulus-stimulus learning

Tuesday, March 17, 11:00 - 12:30, C-Building - N16

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In everyday life, we often generalize previously learned associations between our actions and their outcomes to novel, but similar situations. The present study aimed to conceptually and directly replicate results reported by Esser et al. (2023, Psychological Research), who reported that action-effect (A-E) learning generalizes to categorically similar stimuli. Yet, the overall picture in the published literature is not overwhelming with regard to such generalization, and hence a replication seems to be of particular importance. We present three experiments. In our conceptual replications (Exp. 1 and 2), we did not find significant A-E compatibility effects for either learned or similar stimuli. In the direct replication (Exp. 3), we observed evidence for successful A-E learning, but still failed to replicate the generalization effect for similar stimuli. A critical difference between Experiments 1 and 2 and Experiment 3, however, is that stimulus-stimulus (S-S) learning was not possible in the former two experiments, but in the latter one (as was already acknowledged by Esser et al.). In sum, our results (1) suggest a critical role of S-S learning in this particular design (2) and question whether A-E learning truly generalizes to similar stimuli.

Keywords: ideomotor theory, action-effects, learning, replication

When Trying Harder Helps: Effort Instructions Affect Performance in Complex Motor Tasks

Tuesday, March 17, 16:30 - 18:00, C-Building - N16

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Instructions to try harder can mobilize effort and have been shown to improve performance in simple cognitive tasks (Steinborn et al., 2017), temporarily increasing the amount of cognitive resources used for the task (Kahneman, 1973). Even though such instructions are used in sports to improve athletes performance, previous research neglected to investigate their impact in more complex tasks. This study investigated whether try-harder instructions can improve performance in motor-cognitive coordination tasks of differing complexity, i.e., basketball passing movements with and without head fakes. Basketball novices and experienced players were tested to additionally investigate whether motor expertise modulates the effect of effort mobilisation. Results demonstrated that try-harder instructions improved participants performance overall, reducing response initiation and movement execution times alongside specific reduction in initiation time variability. We also found a significant interaction between the factors type of instruction (standard vs. effort) and expertise (novices vs. experienced players) [$F(1,52) = 13.27, p = .038$]. Post-hoc tests revealed that novices benefited more from try-harder instructions than experts, suggesting that effort mobilization yields greater improvement when motor programs are not yet fully stabilised. An analysis of the distribution of the initiation times revealed that try-harder instructions appear to enhance performance primarily by reducing attentional lapses rather than generally improving processing speed. The results of this study demonstrate that try-harder instructions to mobilise cognitive effort have the potential to improve athletes' performance in important situations.

Keywords: effort, try-harder instruction, deception, sport psychology, action and perception

Contrasting cognitive control in the Simon and spatial Stroop tasks regarding their interference with the control of standing balance

Tuesday, March 17, 16:30 - 18:00, C-Building - N16

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The interaction between cognitive and balance control can be understood best through methods that capture event-related effects of cognitive processes on balance control with high temporal resolution and precision. We developed such an approach to examine how cognitive conflict interferes with body balance during upright standing. Ninety young adult participants stood on a force plate while performing two cognitive conflict paradigms: the Simon task and the Spatial Stroop task. By aligning force plate time series (resembling balance dynamics) to both target and response onset in the cognitive task, we assessed the temporal dynamics of congruency effects on force moment variability as an indicator of simultaneous balance control. In both tasks, incongruent trials reduced force moment variability, which may express a lower rate of balance adjustments during incongruent trials, possibly the consequence of a coincidental inhibition or suppression when cognitive resources are recruited for conflict resolution. The interference time course differed between tasks: reduction of moment variability spanned a shorter time period in the Simon task, whereas interference observed in the Stroop task was slightly longer lasting. These findings replicate and extend earlier results (Johannsen et al., 2023), showing that cognitive conflict robustly permeates balance control through task-specific mechanisms. The results align with predictive and event-driven models of balance control.

Keywords: balance control, cognitive conflict, cognitive-motor interference, Simon task, spatial Stroop task

A Closer Look at the Agent Advantage Effect: The Impact of Chasing vs. Fighting

Tuesday, March 17, 16:30 - 18:00, C-Building - N16

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People extract and filter information from their surroundings to understand everyday events. One important component of events is event roles, which include the agent (action performer) and the patient (action recipient). Human observers react faster toward the agent information than the patient information (agent advantage effect). In our previous studies, we replicated the agent advantage effect using a search task with images of two fish, one fish (the agent) biting the other (the patient). In this project, we investigated whether actions, fighting versus chasing, influence the magnitude of the effect. We observed a significant interaction between action and search task (agent search vs. patient search): the agent advantage effect emerged in the fighting condition but not in the chasing condition. Additionally, the mean reaction time for chasing conditions was significantly faster than that for fighting conditions. These findings suggest that the agent advantage effect depends on the context of the agent–patient relation (fighting vs. chasing). In other words, agents are not always identified faster than patients.

Keywords: agent advantage effect, agent, patient, event perception, action

From interference to priming? Reinterpreting the head-fake effect in basketball through continuous measurements

Tuesday, March 17, 16:30 - 18:00, C-Building - N16

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The present study investigated the head fake in basketball, in which a player passes in one direction while directing the head to the opposite side. The objective was to examine whether the deceptive stimulus feature head orientation induces erroneous motor responses that are measurable through center of pressure (COP) displacements. Twenty participants ($M_{age} = 22.4$) were presented with life-sized video sequences of a basketball player's passes, performed either with or without a head fake. They were instructed to make whole-body movements as if to intercept the pass (buzzer task) or to verbally name the pass direction (vocal task). Reaction times (RTs), movement times (MTs), and COP displacements were recorded. The results of the study demonstrated that head fakes led to significantly longer RTs in both in the buzzer task, $t(19) = 13.027$, $p < .001$, and the vocal task, $t(19) = 14.047$, $p < .001$. COP analyses revealed an early erroneous shift in the buzzer task for head-fake trials that was corrected prior to the initiation of the correct response. This pattern supports a rapid, feedforward priming process rather than an interference explanation of the head-fake effect, at least in this realistic-like setting. Surprisingly, minimal but systematic COP displacements of a similar temporal structure were identified in the vocal task, suggesting the presence of overt motor activations even when no movement was intended. The findings underscore the embodied nature of decision-making processes in sports and extend the application of the rapid chase theory to complex movements.

Keywords: interference, head fake, dynamic measures, COP displacements

The role of the domain-specific expertise on response inhibition in the basketball-specific ARI-task

Tuesday, March 17, 16:30 - 18:00, C-Building - N16

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This study investigated whether domain-specific expertise moderates performance in a basketball-specific anticipation-response-inhibition (ARI) task. Participants with domain-specific basketball expertise, domain-specific handball expertise, and novices without domain-specific expertise were included. In the ARI task, a video of a basketball jump shot was viewed and participants were instructed to respond as precisely as possible at the moment the ball left the attacker's fingertips (go-trials). When a simulated pump fake was viewed (stop-trials), however, participants were asked to inhibit their response. Inhibitory performance was quantified using the PNR, which indicates the point at which inhibition failed in 50% of the trials. Response precision was assessed by using the constant error (CE). To account for strategic response delays favoring precision over inhibition, the corrected PNR was calculated by adding CE to the observed PNR. The results demonstrated that participants with domain-specific basketball expertise showed superior inhibitory control compared to those with domain-specific handball expertise and novices without domain-specific expertise, while no significant differences were observed between participants with handball expertise and novices. Additionally, strategic adjustments based on the preceding trial type were observed, as all participants (irrespective of expertise) delayed their responses in go trials following a stop trial, irrespective of whether the inhibition was successful or unsuccessful. Overall, the findings suggest that domain-specific basketball expertise enhances performance in the basketball-specific ARI task. The question if the expertise effects observed are restricted to the domain-specific task or reflect a generally enhanced inhibitory control cannot be answered and warrants further investigation.

Keywords: response inhibition, basketball, deceptive actions, anticipation skills, motor control

Sweet or Bitter? Meta-Analysis on Affective Outcomes of Revenge

Wednesday, March 18, 09:00 - 10:30, HSZ - N8

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This meta-analysis examined what revenge feels like. We located 53 manuscripts with 98 independent samples, including 14,238 participants. Revenge was linked to positive affective states ($r = .19$, $[-.12, .25]$) but not negative affective states ($r = .06$, $[-.06, .17]$). Specifically, revenge was pleasant when both enacted and envisioned, but not when observed. Revenge was pleasant across assessment time and measurement type. However, this pleasure subsided with time, suggesting that revenge was sweeter during the act than shortly after. Intergroup revenge was sweeter than interpersonal one, and revenge was most strongly related to gratification and empowerment. Findings were consistent across publication status, preregistration presence, participants' age, gender, and race, as well as study type and setting. Conversely, revenge was unpleasant when envisioned and observed, but not when enacted. The link between revenge and negative affective states decreased over the last fifty years and was moderated by the preregistration presence, showing that revenge was bitter in non-preregistered studies but not in preregistered ones. Furthermore, revenge was unrelated to anger, anxiety, and sadness but associated with feelings of hostility instead. Theoretically, these results indicate that revenge is particularly pleasant during the act, emphasizing the rewarding character of retaliatory actions and supporting the reinforcement model of revenge. Practically, they suggest that imagery rescripting can be emotionally beneficial to the victims of transgressions.

Keywords: meta-analysis, affect, emotion, revenge

Visual and Tactile Contributions to Coordination During Object Handovers

Wednesday, March 18, 09:00 - 10:30, HSZ - N8

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Handing an object from one person to another is a common yet surprisingly complex everyday action. Successful give-and-take requires precise coordination: the giver must retain their hold until the taker establishes a secure grip, while the taker must delay moving the object until the giver releases it. Both visual cues and tactile feedback likely contribute to this coordination. Here, we examined handover as a function of object weight (200–1000 g), object height (4–20 cm), and the availability of visual information (vision of hand versus blindfolded). Pairs of participants sat opposite each other at a table. In each trial, a designated giver lifted a cylindrical object (6 cm diameter) and transported it to the table's center, where the taker received it midair and placed it back on the surface. Then the taker assumed the role of giver to hand the object back. There were four trials per object and visual condition. Using video recordings, we measured handover duration, the interval during which both partners simultaneously contacted the object. Handover durations were longer when participants were blindfolded compared to when vision was available. Duration also increased with object weight, with weight effects being substantially larger without vision. In contrast, object height had no measurable impact. These findings indicate that tactile information alone is sufficient to support give-and-take coordination, but vision markedly enhances efficiency. Notably, the visual benefit interacted with the invisible object weight, suggesting that vision facilitates both the initial planning and the real-time fine-tuning required for seamless human handovers.

Keywords: perception, visual, tactile, sensorimotor, joint action

The Effect of Temporal and Spatial Dynamics on Pleasantness of Touch Between Romantic Couples

Wednesday, March 18, 09:00 - 10:30, HSZ - N8

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Touch plays an important role in everyday life by evoking pleasant feelings. People tend to produce more pleasant touch through increased spatial and temporal variation, which reduces predictability (Lo et al., 2021). Furthermore, circular movements are generally perceived as more pleasant than linear ones (Schirmer et al., 2023). In the present study, we investigated how spatial and temporal predictability, as well as movement shape, influence perceived pleasantness for romantic couples. Each of the two partners were once toucher, once receiver. In Experiment 1, participants performed touch on a movement trajectory consisting of six periods of a 2-cm sine- or triangle-wave, with predictability manipulated via amplitude variability: high (constant 1 cm), moderate (0.4 and 1.4 cm), and low (0.4, 1, and 1.4 cm). In Experiment 2, participants performed three strokes along parabolic or linear paths. Strokes were either predictable (constant velocity: 1 or 3 cm/s) or unpredictable (one stroke had different velocity). We also presented strokes that matched the duration of the 1 cm/s or 3 cm/s of strokes in the predictable condition. After each trial, participants rated pleasantness from 1 to 100. Results showed that spatially predictable and smoother trajectories were perceived as more pleasant. In contrast, temporal effects were driven more by stroke duration or velocity than by predictability. Longer strokes, strokes at 3 cm/s, and linear paths were rated as more pleasant. Together with prior work, our results show that movement parameters shape pleasantness, with predictability effects depending on the spatial-temporal context.

Keywords: social touch, temporal predictability, spatial predictability, shape, pleasantness, movement parameters

Liar's Dice: Eye Movements of Deceivers and Challengers

Wednesday, March 18, 09:00 - 10:30, HSZ - N8

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Eyes are often assumed to indicate deception. Yet, most studies typically used instructed deception directed toward screens or confederates. The present study introduced a novel paradigm from the Liar's Dice game. Two players alternated between "bidder", who rolled dice and made truthful or deceptive bids, and "challenger", who judged the bid's veracity. The challenger could contest, ending the round, or accept, becoming the new bidder who rolled new dice and made a higher bid. The challenger won if the contested bid was false and lost if it was true. Participants played against a computer in Experiment 1 ($N = 36$) and against another participant in Experiment 2 ($N = 42$). Three objectives were investigated: effects of non-instructed deception, deceptive social dynamics, and veracity judgments on response times, fixations and blinks. Across experiments, lying produced longer response latencies, fewer and longer fixations. Experiment 2 further showed fewer fixations on the opponent's face when lying, and reduced blink rate. Challengers showed longer response latencies, fewer and longer fixations, fewer blinks when contesting a bid, but also increased attention on the bidder's face. These findings suggest that non-instructed deception reduces eye movements and induces social avoidance, whereas suspicion also reduces eye movements but enhances attention toward the opponent.

Keywords: Eye-tracking, gaze, eye movements, deception, lie, game

Theta-oscillations in Cognitive Control and Social Cognition: Differential Neural Processing of Human and Robotic Agents

Wednesday, March 18, 09:00 - 10:30, HSZ - N8

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Theta-band oscillations are a key neurophysiological correlate of cognitive control and social cognition, coordinating processes such as working memory, conflict monitoring, and intention inference. Cognitive control models highlight medial frontal theta as a marker for performance monitoring and the recruitment of executive function during conflict and error processing. Beyond this, social cognitive frameworks link theta rhythms to intention understanding and adaptive behavior in social contexts. Previous behavioral research shows that automatic imitation is modulated bottom-up by sensory input and/or top-down by intention attribution, with human models often eliciting stronger imitation effects than robotic ones. Automatic imitation is also affected by conflict, e.g., Brass et al. (2000) demonstrating compatibility effects between observed and executed finger movements, emphasizing sensorimotor integration. We examined theta activity in the EEG during observation and automatic imitation of human and robotic hands under congruent and incongruent conditions. Besides, expected effects regarding conflict resolution, we found increased theta for robotic stimuli than human stimuli in brain areas related to visual working memory, visual error search, and in areas linked to intention inference. Participants' slower responses to robotic versus human hands (agent effect) and to incongruent versus congruent trials (congruency effect) suggest parallel but separate cognitive mechanisms for agent and congruency effect. These results support integrative models where theta oscillations facilitate distributed network coordination during visual working memory and social cognitive control, advancing our understanding of differential neural processing of biological and artificial agents relevant for human-robot interaction.

Keywords: theta-oscillations, cognitive control, automatic imitation, human-robot-interaction

What Listening Reveals: Inferring Emotional Context from Listeners' Nonverbal Behavior

Wednesday, March 18, 09:00 - 10:30, HSZ - N8

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When we listen to others' stories, our nonverbal behavior can vary depending on the emotional context of what we hear. But are these differences distinct enough for an observer to infer the emotional context solely from the listener's behavior? And if so, which aspects of gaze behavior do people rely on to make such judgments? To address this question, we filmed participants while they listened to (supposedly) autobiographical narrations told by a confederate. The narrations described experiences of different emotional valence (neutral, negative, positive, and embarrassing). In a subsequent online study ($n = 82$), we then presented 30-second clips of the previously filmed listeners, without any information about the story content, and asked naïve participants to guess the emotional content the observed others were listening to. Participants identified the correct emotional context at rates above chance, though overall accuracy was modest. Accuracy differed significantly across emotional contexts and also showed substantial variability between the listeners. In follow-up studies, we explored which features of listeners' nonverbal behavior contributed to accurate judgments. Together, these results suggest that listeners' nonverbal behavior carries meaningful information about the emotional dynamics of an interaction, even when detached from its verbal content.

Keywords: social cognition, non-verbal behavior, emotional context, listener behavior, social interaction

Sometimes memory misleads: Systematically misleading memory evidence as source of (some) recognition errors

Wednesday, March 18, 09:00 - 10:30, C-Building - N14

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The error speed effect, the observation that items with a fast recognition error in a single-item old-new recognition task have a higher probability of an incorrect response in a two-alternatives forced choice task compared to items with a slow recognition error, is mostly taken as evidence that some recognition errors are attributable to misleading memory evidence. Recently, Akan et al. (2023) demonstrated that the error-speed effect only occurs within misses but not within false alarms, which challenges the prediction of several recognition models that predict the error-speed effect for both misses and false alarms. In the present study, we investigate whether false alarm can in general be caused by systematically misleading memory evidence or are alternatively only elicited by random fluctuations in the decision process (diffusion model) or by incorrect guesses (two-low threshold-model). Therefore, we manipulated the similarity between studied items and non-studied items to increase systematically misleading memory evidence within false alarms. Using a sequential sampling plan, we found evidence in favour of the occurrence of the error-speed effect within false alarms, indicating that false alarms, too, can sometimes be elicited by systematically misleading memory evidence.

Keywords: recognition memory, memory errors, misleading memory evidence

The lineup confidence model: A multinomial processing tree model for measuring confidence in lineups

Wednesday, March 18, 09:00 - 10:30, C-Building - N14

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Because confidence in lineup responses is important in research and practice, it is important to understand how confidence relates to the cognitive processes underlying lineup responses. Here we introduce the lineup confidence model, a multinomial processing tree model for measuring confidence in lineups. The model builds on an established multinomial processing tree model that separates four cognitive processes underlying lineup responses: culprit-presence detection, culprit-absence detection, biased suspect selection, and guessing-based selection. The lineup confidence model additionally incorporates the measurement of confidence. To test the validity of the lineup confidence model, we conducted an experiment using post-response feedback as a manipulation of confidence. Responses based on detection yielded higher confidence than responses based on guessing, and responses based on biased suspect selection also yielded higher confidence than responses based on guessing. Post-response feedback selectively influenced confidence while leaving the parameters for culprit-presence detection, culprit-absence detection, biased suspect selection, and guessing-based selection unaffected. Confidence can thus be sensitively measured with the lineup confidence model without compromising measurement of the other processes.

Keywords: eyewitness testimony, lineups, memory, decision making, cognitive modeling, confidence judgments

How much misinformation can people take? The eyewitness misinformation effect as a function of the number of detected discrepancies between original and post-event information

Wednesday, March 18, 09:00 - 10:30, C-Building - N14

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Our research goal was to explore limits to the impact of misinformation on eyewitness memory. In two studies using the standard eyewitness misinformation paradigm, we showed participants a series of slides accompanied by narratives including a total of 15 misleading details. After an initial cued recall test (allowing us to capture the size of the misinformation effects), we asked participants to retrospectively indicate for which details they had noticed a discrepancy between original and post-event detail information. We found (in Study 1; $N = 81$) that the misinformation effect (operationalised through both misinformation endorsement and accuracy for original details) was significant and stable up to about seven detected discrepancies and clearly declined with higher numbers of discrepancy detection, suggesting that there are indeed limits to how much misinformation people are willing to take. In Study 2 (planned $N = 221$), we extended the generality of this finding using a different set of materials and a slightly different procedure, replicating the essential findings of Study 1.

Keywords: memory, misinformation, cued recall, discrepancy detection

Confidence judgements during police lineups: effects on guessing-based selection

Wednesday, March 18, 09:00 - 10:30, C-Building - N14

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When eyewitnesses identify someone in a police lineup, it is common practice to ask them for their confidence in that decision. In light of research pointing to reactivity effects of confidence judgments in various cognitive tasks, the question arises whether obtaining confidence judgments during police lineups affects the cognitive processes underlying eyewitness responses. These processes were measured using the two-high threshold eyewitness identification model. Participants watched a staged-crime video before completing four sequential lineups, one for each culprit. Asking participants for their confidence after each decision in the lineup had no effect on any detection-based processes. Instead, it significantly increased the probability of guessing-based selection. This pattern can be explained by assuming that allowing eyewitnesses to report low confidence for identifications makes it feel acceptable to identify someone even when the decision is based on guessing. Supporting this interpretation, instructing participants to identify lineup members only with high confidence and denying them the opportunity to report low confidence decreased guessing-based selection relative to a control condition without confidence judgments. These findings indicate that the effect of confidence judgments on eyewitness identification depends on how confidence is used: The opportunity to qualify an identification with a low-confidence judgement enhances guessing-based selection, whereas restricting identifications to high-confidence decisions reduces it relative to a condition without any confidence judgements. For police practice, these results suggest that confidence judgements during lineups should be used in combination with an explicit instruction for eyewitnesses to make an identification only when they are very confident.

Keywords: Police lineups, eyewitness identification, multinomial modeling, confidence judgements

Age-related differences in the cognitive processes underlying eyewitness responses to lineups

Wednesday, March 18, 09:00 - 10:30, C-Building - N14

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It has been repeatedly shown that in police lineups, older eyewitnesses are less likely to correctly identify a culprit than younger eyewitnesses. Instead, they are more likely to wrongfully select an innocent suspect or a filler. Here, we used the two-high threshold eyewitness identification model to assess age-related differences in the cognitive processes that underlie these observable responses. First, a large dataset ($N = 10.324$ responses to lineups) originally collected for a different purpose was reanalyzed. The cognitive processes of culprit-presence detection, culprit-absence detection and guessing-based selection were compared across young to middle aged adults, young-old adults and old-old adults. Then, a novel experiment ($N = 6.052$ responses to lineups) was conducted, which corroborated the findings of the reanalysis: The probability of culprit-presence detection and, descriptively at least, the probability of culprit-absence detection decreased with age, whereas the probability of guessing-based selection increased. These results highlight possible challenges to the validity of eyewitness testimony from older adults and offer insights on possible strategies to mitigate them.

Keywords: police lineups, eyewitness identification, aging, two-high threshold eyewitness identification model, multinomial processing tree model

Investigating Age Effects on Face Recognition: The Temporal Stability of Face Adaptation

Wednesday, March 18, 09:00 - 10:30, C-Building - N14

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Face recognition declines with age, potentially due to impairments in integrating new information into existing memory representations. Face-adaptation studies provide a powerful approach to examine this process, as they assess how prior visual experience influences subsequent perception and memory of faces. Previous studies from our lab demonstrated comparable face adaptation effects for younger adults (YAs) and older adults (OAs) when adaptation and test phases in face-adaptation experiments were separated by short intervals (300 ms) and induced for non-configural facial attributes such as facial brightness and contrast, suggesting that adaptation is preserved across age. However, such short intervals could primarily represent low-level perceptual mechanisms. It therefore remains unclear whether the temporal robustness of face adaptation and thus adaptation on a more long-term memory level differs with age. In two online experiments, we examined adaptation for brightness (Experiment 1) and contrast (Experiment 2), increasing the interval between adaptation and test phases to five minutes—an interval that should involve long-term memory mechanisms. Both experiments revealed robust adaptation effects for YAs and OAs, with comparable effect magnitudes across groups. These findings show that face adaptation for brightness and contrast remains temporally robust in both younger and older adults. The adaptive updating of face representations with respect to these attributes appears stable across the adult lifespan, challenging the assumption of impairments in integrating new information into existing face memory representations in older adulthood.

Keywords: face adaptation, face perception, face memory, non-configural face information, age effects, ageing, plasticity

The contribution of time perception to the Date/Delay-effect in temporal discounting

Wednesday, March 18, 09:00 - 10:30, C-Building - N16

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The term temporal discounting describes people's often-observed preference for smaller, but sooner (SS) rewards over larger, but later (LL) rewards. This discounting effect is reduced when the time period to wait for the LL is expressed as an end date (e.g. April 3rd) rather than a delay (e.g. 80 days). Several explanations of this *Date/Delay Effect* have been put forward, one of which is the differential time estimation hypothesis claiming that the duration expressed as an end date is perceived as shorter. The few empirical demonstrations in favor of this view used rating scales for subjective duration judgments that have severe methodological shortcomings. To achieve a more comprehensive approach, an objective psychophysical discrimination task was used in the current study. In two online experiments ($N = 140$ and $N = 80$), participants made speeded decisions comparing which of two periods (one expressed as a date, one expressed as a delay in days) was shorter (or longer). The psychometric functions not only showed a clear bias to view the dates as shorter than the delays, but it could be quantified by estimating the point of subjective equality (PSE) which conformed to a delay-to-date ratio of about 83% and 93% in Studies 1 and 2, respectively. The robustness of the finding and potential correlates are discussed.

Keywords: decision making, temporal discounting, time perception

Inside the Flow State: Continuous and Real-Time Measurement of Flow

Wednesday, March 18, 09:00 - 10:30, C-Building - N16

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Flow is defined as a psychological state characterized by becoming deeply absorbed in a task, losing track of time, and diminished self-awareness. Flow research typically involves associating physiological data recorded during a task with subsequently completed questionnaires (i.e., post-task reports). This approach is limited due to the temporal mismatch between the continuously recorded physiological data and the post-task reports of flow. We introduce a novel method that enables the continuous, real-time measurement of perceived flow. Participants continuously indicated their perceived degree of flow in real time by pressing a custom-made foot pedal while engaging in a flow-inducing task (playing the video game Thumper in virtual reality), and electrocardiogram (ECG) signals were recorded as a physiological measure. In the first experiment, participants played the game under two conditions, one with the pedal and one without as a baseline. After each condition, they completed the validated Flow Short Scale (FSS). The second experiment included an extended 40-minute gameplay session with performance measurements. Our results suggest that interacting with the pedal did not interfere with the flow experience nor did it alter heart rate variability (Experiment 1). Moreover, the pedal measurement provided a reliable continuous self-assessment of flow, as indicated by correlations between real-time and post-task flow ratings (Experiments 1 and 2). Overall, our findings confirm that the proposed method enables the assessment of the temporal evolution of flow and the accompanying physiological markers.

Keywords: flow experience, time perception, real-time measurement, heart rate variability

Response Times in Intertemporal Choice Do Not Support Dual-System Models: Evidence from a Large-Scale Meta-Study

Wednesday, March 18, 09:00 - 10:30, C-Building - N16

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Models of intertemporal choice (ITC) have traditionally focused on choices. Recently though, a growing interest in the underlying cognitive processes has initiated the development of process models, such as dual system theories and evidence accumulation models. However, process models require process data, and yet ITC research has largely overlooked even the simplest process data – response times (RTs). This project aims to bridge that gap by exploring reliable relationships between choice and RT in ITC, such as faster smaller-sooner than larger-later choice as predicted by dual-system theories. We conducted a systematic search across two major databases and have retrieved 112 datasets including both choices and RTs from ITC studies with a wide range of experimental designs. In total we have gathered data from over 12,000 subjects from diverse populations and over one million trials. In addition to behavioral data, we collected methodological and sample information (e.g., task procedure, incentivization, age). This provides a strong foundation for the identification of robust effects. We analyzed the data compilation using hierarchical linear models. The results show no support for the predictions made by dual system theories but are in line with evidence accumulation accounts. We additionally explore potential moderating factors of these effects both on a study and a participant level. More generally, the project shows the value of including RT data to distinguish between different models of ITC

Keywords: Intertemporal choice, Response times, Dual-system theory, Evidence accumulation models

Why we want apples but choose chips: The behavioral overlap of policy- and preference-based learning

Wednesday, March 18, 09:00 - 10:30, C-Building - N16

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Choosing between options can be driven by both preferences, resulting from outcome evaluation, and strategic policy considerations, driven by action selection. Traditional decision-making theories assume a strict separation between these two processes. In contrast, the predictive coding framework provides a unified formal model that integrates valuation and action selection. It assumes two kinds of hierarchical and interacting predictions and prediction errors: one encodes “policies” and the other “preferences”. Here, we pitted these two views against each other, asking whether behavioral manipulations that primarily target action selection or outcome valuation produce distinct or overlapping effects on subsequent choices and preferences. To address this, we compared approach-avoidance training (AAT), a non-reinforced learning method that targets action policies, with evaluative conditioning (EC), a reinforced learning approach that targets outcome preferences in terms of how they influenced participants' choices and preferences. In Experiment 1, using facial stimuli, only EC affected choices and preferences. However, in Experiment 2, using doodles, both approach and avoidance pairings in AAT positively modulated choices and preferences, whereas EC effects were confined to negative pairings only. Experiment 3 employed joystick responses, providing a more ecologically valid measure; here, only approach pairings in AAT resulted in positive effects on choices and preferences. Together, these findings indicate partial overlap and cross-influence between policy- and preference-based learning mechanisms rather than a strict interaction. Hence, our results challenge the strict functional separation between policies and preferences assumed in traditional theories and further highlight that their interaction also depends on stimulus type and response modality.

Keywords: decision-making, predictive coding framework, approach-avoidance training, evaluative condition, Bayesian generalized linear modeling, action selection, outcome evaluation

Nudges For People Who Think

Wednesday, March 18, 09:00 - 10:30, C-Building - N16

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We investigated the limits of default nudges in the context of setting indoor temperatures. In Experiment 1, participants chose a hypothetical thermostat setting where the default varied widely (14°C to 32°C). Contrary to standard predictions, temperature choices showed no systematic relation to the default or to the control condition. Verbal reports indicated that participants relied heavily on stable internal priorities, primarily comfort and cost, and were often suspicious of the default, especially when it appeared extreme. These "trick me" attributions suggested awareness of the potential influence attempt. Experiment 2 tested whether providing a rationale (comfort, finance, or environment-based) would increase reliance on the default. Behavioral changes were minimal but directionally aligned with the rationale, such as slightly higher settings with the "environmental" and "comfort" explanations. However, participants selectively incorporated the rationale, mostly reverting to their "comfort" and "cost-based" reasoning. Suspicion toward the default persisted, particularly when the provided explanation did not align with existing beliefs. These findings suggest that temperature-setting behavior is highly resistant to default nudges. Defaults produce minimal movement because people anchor their choices in strong, stable personal considerations and remain sensitive to cues that signal possible manipulation. These studies provide a combined behavioral and verbal blueprint for investigating and clarifying why default nudges fail in contexts where individuals have strong prior preferences. It challenges the notion that people are passive decision-makers or lazy thinkers, showing they actively evaluate the intent behind the nudge and prioritize their own judgment.

Keywords: Decision Making, Default Nudges, Verbal Protocol Analysis

Decision-making in planarians

Wednesday, March 18, 09:00 - 10:30, C-Building - N16

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Planarians are comparatively simple invertebrates, evolutionary close to the predecessors of vertebrates, featuring a rope-ladder nervous system containing only tens of thousands of neurons. We studied *Girardia tigrina*, which has about 40,000 neurons in total, roughly a third of them in the cerebral ganglia, homologous to the vertebrate brain. We aimed to determine whether this animal can make an early decision when faced with two equally attractive targets. Sixty-five animals were placed in a Petri-dish with two millimeters of water at a marked starting point. Two black cubes, each measuring 20x20x20 mm, were positioned 25 mm away from the start. The angle between the straight lines from the starting point to the middle of the cubes was approximately 90°. Each animal performed five runs. Of 325 runs in total, 324 ended at a cube. When averaging all paths leading to the left cube and all paths leading to the right cube, these two average paths formed a distinct V-shape. We simulated a gradient descent based on a one-dimensional circular optical field. The overlay of hundreds of simulated paths produced a Y-shape with a high central node, nearly a T-shape. These findings indicate that the planarians were able to segregate the visual input into two separate targets and decide, right from the start, which to approach. The mechanisms allowing the planarians to do this are still unclear - they must be more complex than simple gradient descent.

Keywords: Planarian, Decision Making, Segregation, Animal model, Gradient Descent, Comparative Psychology

An Updated and Expanded Meta-Analysis of Findings from the Weapon Identification Task

Wednesday, March 18, 11:00 - 12:30, HSZ - N8

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The weapon identification task (WIT; Payne, 2001) is a prominent implicit measure of racial stereotyping. In this experimental sequential priming paradigm, participants classify objects (weapons vs. tools) following brief presentations of Black or White male faces. The so-called stereotype effect in the WIT reflects faster and/or more accurate responses to Black-gun and White-tool pairings than to Black-tool and White-gun pairings. Previous meta-analytic summaries (Rivers, 2017; Kidder et al., 2018) have corroborated this effect but have certain constraints, such as unexplained heterogeneity, limited search coverage, and the absence of moderator analyses. To provide a more comprehensive and systematic assessment, we conducted a meta-analysis of 35 WIT studies conceptually aligned with Payne's (2001) original paradigm. In addition to estimating overall stereotype effects in mean response times and error rates, we examined potential sources of between-study heterogeneity, focusing on response-deadline strictness, participant gender, and publication year. Results revealed significant small-to-medium stereotype effects for mean response times ($g_z = 0.39$, 95% CI [0.29–0.49]) and error rates ($g_z = 0.42$, 95% CI [0.33–0.51]). Deadline strictness moderated the stereotype effect for error rates only, with stronger effects observed under stricter deadlines. Furthermore, the stereotype effect increased with the proportion of female participants across both dependent measures. Finally, the stereotype effect declined across publication years, though only for mean response times. These findings offer transparent, reproducible, and up-to-date evidence for stereotype effects in the WIT while highlighting design- and sample-related moderators that may account for previous heterogeneity.

Keywords: meta-analysis, weapon identification task, stereotypes, racial bias, priming

Multi-Measure Analysis of Asymmetric Gaze Interaction Reveals Distinct Roles of Fixations, Blinks, and Pupils

Wednesday, March 18, 11:00 - 12:30, HSZ - N8

Mehtap Çakır^{1*}, Anke Huckauf¹

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Real-time gaze interaction involves the interplay of multiple eye parameters, yet their distinct and complementary functions remain poorly understood. In this study, we examined eye behavior of 25 dyads using a nonverbal dyadic paradigm with asymmetrical partner roles. One partner (listener) heard emotion-inducing auditory stimuli and experienced the evoked emotions, whereas the other (observer) attempted to infer the listener's emotional state solely through gaze. The observer neither heard the audio nor knew its timing. Masks and a partition confined visible information to the eye region alone. The experimental protocol unfolded across three temporally structured phases: baseline (fixation on cross), audio (mutual gaze during emotional induction), and silence (continued mutual gaze post-stimulus). Our analyses revealed that fixation, blink, and pupil parameters primarily reflected role-specific and phase-dependent processing demands rather than emotional valence. Blinks marked distinct attentional priorities for each role, with interpersonal blink synchronization decreasing when partners' attentional goals diverged, demonstrating attentional coupling as a prerequisite for coordinated blinking. Fixations showed shared attention allocation across roles, characterized by active visual exploration during mutual gaze phases. Pupil dilation indexed phase-dependent arousal and cognitive effort, particularly pronounced in observers. These findings show that advancing our understanding of real-time gaze communication requires modeling the eyes as an integrated system where fixations, blinks, and pupils serve distinct yet complementary functions in dyadic interaction.

Keywords: dual eye-tracking, mutual gaze, dyadic gaze interaction, interpersonal synchronization, blink behavior, pupil dilation, fixation

Introducing the Truth Effect Database (TED) - A Harmonized, FAIR Database for Illusory Truth Effect Research

Wednesday, March 18, 11:00 - 12:30, HSZ - N8

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Efforts to make research data FAIR (Findable, Accessible, Interoperable, and Reusable) have transformed how we share information, yet many datasets still fall short of enabling true interoperability and reuse. In this talk, we introduce the Truth Effect Database (TED), which addresses this gap within research on the illusory truth effect, providing a harmonized, trial-level, open resource that integrates meta-data and raw data from 56 studies, 27 publications, over 12,000 participants, and nearly 780,000 trials. To promote usability, TED focuses on user-friendly data submission using a custom entry website and data extraction using the R-package `acdcquery`. These tools guide researchers through both data entry and retrieval, eliminating the need for direct interaction with the database's internal structure. In this talk, we will introduce TED's architecture and tools, demonstrate example analyses using Bayesian multilevel models, and show how the database reveals robust individual differences in the truth effect moderated by temporal delay. We will also discuss potential future applications of TED and the direction of open data in the field. By combining transparent infrastructure with harmonized design, TED illustrates how psychological science can advance beyond open data toward genuine data interoperability and cumulative, collaborative discovery.

Keywords: open science, open data, reusability, reproducibility, database, sql

Fairness in AI Resource Allocation: Influences on Trust, Acceptance, and the Intention to Use

Wednesday, March 18, 11:00 - 12:30, HSZ - N8

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Christopher Esch¹

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Artificial Intelligence (AI) is becoming increasingly integrated into decision-making processes, yet it remains unclear how individuals perceive and evaluate the fairness of AI systems in different resource allocation scenarios. This study examined how variations in distributive fairness (decision outcomes: favourable vs. unfavourable; within) and procedural fairness (transparency level: low vs. balanced vs. high; between) influence perceived fairness, trust, acceptance, and intentions towards AI-based allocation decisions. Using an experimental vignette design, participants ($N = 929$) evaluated four AI-based resource allocation scenarios (e.g., kindergarden spots). In line with prior research, our linear mixed-model results showed that outcome favorability was the strongest predictor for all dependent variables. Surprisingly, in contrast to our expectations and prior studies, the degree of transparency, operationalized as the amount of information shared with participants, did not significantly affect perceived fairness, trust, acceptance, or usage intentions. These findings highlight the robustness of outcome favorability effects across different resource allocation contexts while simultaneously raising questions about the appropriate operationalization of transparency in such settings. In this regards, we conclude that future research may benefit from differentiating between information quantity, information content (e.g., process vs. algorithm), and complexity, to better capture the multifaceted role of transparency in shaping human responses to AI.

Keywords: AI-based decision-making, outcome favourability, transparency, trust, acceptance, intention to use

Experimental Human-Centered Privacy and Technical Approaches for Privacy-preserving Empirical Research

Wednesday, March 18, 11:00 - 12:30, HSZ - N8

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Human-centered privacy (HCP) is a rapidly growing field at the intersection of psychology, digital technology, and computer science. Psychologically, HCP explores individuals' perceptions, emotions, motivations, behaviors, and attitudes toward privacy, including those of specific user groups such as companies. This underscores the importance of understanding how various psychological factors influence privacy-related decisions at both the individual and group levels. However, research that investigates privacy with a focus on the intersection of experimental psychology and computer science remains limited. In this presentation, we share findings from our research projects that investigate key aspects of HCP, such as privacy awareness, trust in privacy, attitudes toward privacy, and privacy-preserving behaviors, in relation to privacy-by-design, digital software development, use cases, and various applications. Our joint research, conducted as part of the PrivateEye project, is grounded in relevant psychological theories and experimental methods. Based on our experimental results, we discuss how human factors, including personality, language, privacy experience, age, gender, culture, education, familiarity with digital media, and adherence to ethical and GDPR standards, may influence privacy-related decisions and user experience. These results should then guide and support the development of technical privacy solutions, such as the PeQUES and PrePAMS platforms that we have developed to support privacy-preserving web-based surveys, which we will also introduce in our talk.

Funding: Our joint projects are in part funded by the DAAD under the Taz'iz funding. <https://www.daad.de/en/information-services-for-higher-education-institutions/further-information-on-daad-programmes/taziz-partnership/>

Keywords: human-centered privacy, self-disclosure, privacy paradox, technical privacy designs, ethics

Associations Between Thermal Pain Processing and Psychopathology: Insights from a Multimodal Experimental Approach

Wednesday, March 18, 11:00 - 12:30, HSZ - N9

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Temperature sensitivity and pain processing have been linked to psychopathology, yet findings remain mixed and comparability across studies is limited. There is a need for experimental settings that are well tolerated by participants, can be reliably monitored by experimenters, and enable reproducible procedures with computer-assisted data acquisition. We developed a PsychoPy-based tool for a reaction-time-independent assessment of temperature sensitivity and pain processing via thermal induction. The tool controls and interfaces with a cold/hot plate. Participants provide self-ratings of pain perception on a touchscreen using a Visual Analogue Scale (VAS). Hand-plate contact force is measured using load cells. By continuously and synchronously recording plate surface temperature, VAS ratings, and hand-plate contact force, the tool enables the computation of multiple indicators of pain sensitivity (e.g., pain threshold and tolerance) and behavioral factors (e.g., approach and avoidance tendencies) within a single experimental setting. Timestamped data further allow precise integration with concurrently assessed biomarkers (e.g., heart rate variability) and self-reports of affective states before and after an experimental run. We present the tool and illustrate its application in studies involving children, adolescents, and adults. We demonstrate how key measures of pain sensitivity and processing can be derived. At the time of the conference, data collection for our ongoing adult study will be completed, and we will present results evaluating the validity and reliability of different experimental conditions (e.g., heat versus cold pain) as well as associations with psychopathology (e.g., depressive and borderline personality pathology).

Keywords: pain processing, psychopathology, adolescents, adults, psychopy, data recording

Neural and Behavioral Correlates of Memory Suppression: The Role of Trait Anxiety and Negative Affect

Wednesday, March 18, 11:00 - 12:30, HSZ - N9

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Actively excluding unwanted memories from awareness, or retrieval suppression, supports mental well-being. Yet how mood states and personality traits influence this process remains unclear. This study uses the Think/No-Think (TNT) paradigm to investigate how suppression of emotional memories is modulated by trait anxiety, state anxiety, subclinical depression, and stress. Twenty-one participants learned cue–target word pairs of varying emotional valence (neutral, negative, positive) and later either retrieved or suppressed specific targets, followed by the final recall tests. For the behavioral analysis, the final recall test showed significant suppression (reflected in lower recall of to-be-suppressed items), with reliably greater effects for emotional than for neutral items. As predicted, EEG markers of cognitive control (frontocentral N450 peak) and conscious recollection (left parietal LPP wave, 500–900 ms) showed significant TNT condition effects. No-Think trials elicited a reliably more negative N450 amplitude and shorter latency, with emotional items showing reliably longer latencies compared to neutral items. The LPP mean amplitude was significantly higher in the Think condition. General linear models and Pearson's correlations revealed that suppression-induced forgetting depends on emotional valence, and is shaped by negative affect & trait anxiety, and their influence on neural activity.

Keywords: episodic memory, inhibitory control, ERPs, emotional valence, trait anxiety, negative affect

Boundary Conditions for the Nameability Advantage in Object-Location Memory

Wednesday, March 18, 11:00 - 12:30, HSZ - N9

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Remembering where things are is essential for everyday functioning, yet the processes that determine which locations are remembered best are not fully understood. Locations of objects that are easy to name are typically remembered better than locations of objects that lack a clear verbal label. In a series of experiments, we systematically manipulated the nameability of objects, the nameability of their locations, and the configuration of simultaneously presented easy-to-name and difficult-to-name objects. Participants viewed sets of four objects on a screen, either at positions with easy or more complex labels. The objects were presented in different configurations, either four of the same type or a mix of easy- and difficult-to-name objects. After a filled retention interval, the objects were shown again one at a time, and participants indicated where they had previously been located. For objects presented in a homogeneous configuration during encoding, we found a clear location-memory advantage for easy-to-name compared to difficult-to-name objects. Furthermore, locations of easily nameable objects were remembered even better when they appeared at easily nameable positions, suggesting that the verbal link between objects and their locations enhances location memory. However, when objects were presented in a heterogeneous context (e.g., an easy-to-name object together with difficult-to-name objects), the nameability advantage decreased. These findings advance our understanding of when and how verbal labels support memory for object locations, showing that nameability aids memory primarily when the visual context permits consistent verbal coding.

Keywords: episodic memory, spatial memory, object-location memory, nameability, context

Context effects on memories consolidated during sleep and wakefulness

Wednesday, March 18, 11:00 - 12:30, HSZ - N9

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Textbook knowledge holds that memory is context-dependent, with similar contexts during encoding and recall facilitating memory performance. However, this does not seem to hold across all memory systems. We asked whether context effects on memory may be mediated by differential consolidation of event-context associations during sleep and wakefulness. Healthy participants performed a cued stimulus-response (S-R) learning task that required speeded object classification. Learning was followed by two hours of either sleep or wakefulness. Testing was conducted in either the same or a different context, with context manipulation involving different labs at different campuses, different experimenters, and different display technology (standard PC screen vs. virtual reality headset). Reaction times revealed stronger S-R memory after sleep than wakefulness with retrieval in the same context, and this benefit was linked to increased sleep spindle activity. In contrast, S-R memory was stronger after wakefulness than sleep when tested in a different context. This wake-dependent enhancement had a fast onset and was reversed by delayed sleep. Our results confirm that sleep strengthens the binding of an event with its context. They further suggest that wakefulness stabilizes event memory per se.

Keywords: stimulus-response learning, memory, sleep, polysomnography, context

Can naming pictures distract you from encoding their relevant features?

Wednesday, March 18, 11:00 - 12:30, HSZ - N9

Krzysztof Piatkowski^{1*}, Cihan Altunkaynak¹, Alessandra Souza²

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Using verbal labels to describe perceived objects helps memory retention as it draws attention to the named features. Research shows that those labeling benefits are stronger when the label describes a feature specifically rather than generally (“RED” rather than “WARM”). In our project we investigate whether this benefit might be at the cost of overlooking commonalities between items belonging to the same category. In our experiments we ask participants to memorize lists of colored objects drawn from different categories (e.g., instruments, animals, vehicles, clothing, furniture). In the similar-color condition, objects from the same category are presented in hues of the same color category. In the dissimilar-color condition, there is no overlap in colors for same-category objects. In Experiment 1 we manipulate the presentation of labels together with the objects in two conditions: specific labels (“green APPLE”) vs general labels (“green FRUIT”). Color memory is subsequently probed in a color-reproduction test, wherein previously presented objects filled with gray are presented, and their color is to be selected from a color wheel. In Experiment 2 we extend this design by adding a control, articulatory suppression, condition, and in Experiment 3 we present additional foils- exemplars of the categories presented during the learning phase- at test to further examine if general labels facilitate establishing bonds between colors and categories. Our results suggest that the labels referring to the objects’ categories bring more benefits than object-specific ones when the colors are grouped along categories, yet color-grouping itself might overshadow the effects of verbal labeling.

Keywords: Visual Memory, Verbal Memory, Verbal Labeling, Feature Binding

Calibrating Autonomous Vehicles' Prosociality in Interaction with Human Road Users: A Qualitative Field Study in San Francisco's Mixed Traffic

Wednesday, March 18, 11:00 - 12:30, HSZ - 7E02

Katrin Hauber^{1*}, Sebastian Preis¹, Arnd Engeln¹

¹Stuttgart Media University, Germany

Prosocial traffic behavior – yielding, coordinating, and signaling to reduce others' risk – underpins human–automation co-existence in mixed traffic. However, real-world evidence on when and toward whom automated vehicles (AVs) should act prosocially is scarce. A mixed-methods field study in San Francisco combined 13 naturalistic observations (11 in-ride, 2 curbside) with 28 semi-structured interviews with pedestrians, cyclists, and drivers conducted within SALSA, a project funded by the German Federal Ministry for Economic Affairs and Energy. The analysis centered on prosocial AV-interactions, synthesizing expectations, experiences, and observed interaction patterns. Expectations were strongly role dependent: 77% of pedestrians and all cyclists prioritized defensive, prosocial AV behavior, whereas 42% of drivers did so, emphasizing predictability and assertiveness to sustain traffic flow. Observations mirrored this asymmetry: AVs were consistently defensive with vulnerable road users but displayed more assertive maneuvers in vehicle-to-vehicle interactions, three judged safety-critical (e.g., tight passes at bottlenecks). Drivers reported exploiting overly cautious AVs (e.g., cutting in), revealing a reciprocity gap that penalizes one-sided prosociality. This role-sensitive adaptation may help explain positive evaluations of AVs in San Francisco. However, lacking communication was a recurring concern, detracting from perceived prosociality. eHMI cues were noticed by only a minority of interviewees, undermining coordination in close-range encounters. The study supports a context-sensitive framework of prosocial assertiveness: (a) deferential behavior toward vulnerable users; (b) calibrated, norm-consistent assertiveness with other vehicles to prevent exploitation; and (c) eHMI that clearly communicates recognition and intent. These insights yield concrete behavioral and interface targets to foster cooperative, safe, legible mixed traffic.

Keywords: prosocial behavior, automated vehicles, mixed traffic, cooperation; eHMI; field study

Evaluation of communication concepts for automated vehicles from the perspective of cyclists, pedestrians and manual car drivers

Wednesday, March 18, 11:00 - 12:30, HSZ - 7E02

Nuria Brüggemann^{1*}, Katrin Hauber¹, Arnd Engeln¹

¹Stuttgart Media University, Germany

The SALSA project, funded by the German Federal Ministry for Economic Affairs and Energy, aims to develop innovative communication concepts for mixed traffic involving automated vehicles. The goal is to ensure safe and intuitive interaction between automated vehicles and various road users. Following a user-centered design process, four communication prototypes were developed: Avatar, AV to X, 360° all-round display, and Expressive Driving Dynamics. Each prototype was adapted to specific traffic scenarios and tailored to the perspectives of pedestrians, cyclists, and car drivers. To present the concepts, user narratives and graphical depictions were created, illustrating the respective traffic situations and communication strategies. In the qualitative evaluation, pedestrians, cyclists, and manual car drivers were each presented with the prototypes corresponding to their respective traffic scenarios. Additionally, one domain expert per group was interviewed. The semi-structured interviews focused on user experience, acceptance and potential areas for improvement of the communication prototypes. The presentation outlines the development and evaluation of the prototypes and discusses implications for designing effective communication strategies that foster trust and mutual understanding in interactions between humans and automated vehicles.

Keywords: Human–automation interaction, Automated vehicles, User experience, Trust in automation, Qualitative evaluation

Evaluation of concepts for teaching automated driving functions: Insights from a qualitative user study

Wednesday, March 18, 11:00 - 12:30, HSZ - 7E02

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Within the research project SALSA funded by the German Federal Ministry for Economic Affairs and Energy (<https://projekt-salsa.de/>), a human machine interface (HMI) system for automated driving is developed to teach users capabilities and limitations of different automation levels before, during and after the drive. By employing an iterative user-centered design approach, the needs of different user groups are considered from the first stages of development. The study to be presented at the congress aims to obtain user feedback on innovative ideas of three concepts for teaching automated driving functions. The concepts, presented in the shape of user narratives, differ in how users are motivated to behave in accordance with the respective automation level, how trust in the system is fostered, the extent to which individual user characteristics are taken into account, and when and through which media information is conveyed. In the qualitative interview study, the three concepts are evaluated by four different user groups, that are expected to have diverse requirements for an automated driving education system. The results reveal ambivalent attitudes toward many of the ideas, particularly regarding ideas in which the HMI employed an emotional communication style. While some participants preferred a playful and emotional tone, others favoured a factual and rational style of communication. These findings suggest that one-fits-all HMI concepts for teaching automated driving functions may not adequately address the diverse needs of users. The participants' feedback will inform further refinement of the concepts which will subsequently be evaluated in a driving simulator study.

Keywords: automated driving, driver education, mental model, level-compliant behaviour, user experience

Improving Weather-Risk Communication: Effects of Spatial Resolution and Forecast Format on Perceived Risk

Wednesday, March 18, 11:00 - 12:30, HSZ - 7E02

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Low probability forecasts are often not taken seriously enough. This is particularly problematic for extreme weather events with potentially severe consequences. A fundamental challenge arises from an inherent probability-uncertainty trade-off: widening the forecast area (lower spatial resolution) increases probabilities but also the uncertainty about where the event may occur and therefore, if the user will be affected—“wind gusts in the state of Baden-Württemberg” is more likely than “wind gusts in Tübingen”. We conducted an online experiment with a quota-representative sample for Germany ($N = 1182$) to investigate how spatial resolution of probabilistic forecasts influence the perceived risk to be affected. We employed a mixed factorial design in which spatial resolution and forecast probability were varied within subjects and forecast presentation format between subjects in three conditions: i) numeric descriptions only, ii) maps retaining similar spatial patterns across resolutions, and iii) maps showing substantial structural change when aggregated, including reduced zero-probability areas and larger contiguous regions with elevated probabilities. Spatial resolution affected risk perception differently depending on the format: When forecast information was presented numerically, participants estimated their likelihood to be affected to be lower for forecasts with lower spatial resolution. With maps, this decline did not occur; instead, estimates aligned more closely with forecasted probabilities— independent of spatial resolution. Across all formats, trust and perceived usefulness were highest for high-resolution forecasts and decreased with lower resolution. This suggests that although forecast maps might elude the probability-uncertainty trade-off, lower spatial resolution might still affect how the information is perceived and used.

Keywords: risk perception, extreme weather, probabilistic forecasting, spatial resolution, uncertainty communication, online experiment

Risk and Complexity of Climate Consequences Reduce Sustainable Behavior

Wednesday, March 18, 11:00 - 12:30, HSZ - 7E02

Sebastian Olschewski^{1 2*}, Zahra Rahmani Azad¹, Ulf J. J. Hahnel³

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Investor, consumer, and managerial decisions are central to both the causes and solutions to climate change. Yet the consequences of these decisions are often risky and complex, creating cognitive barriers to sustainable behavior. Building on recent theories of resource rationality and motivated cognition, we examine how information-processing constraints under risk and complexity shape sustainable decision-making. Across three incentive-compatible experiments, participants repeatedly chose between options differing in their climate and personal reward consequences. We manipulated each attribute to have either risky, complex, or certain outcomes. Sustainable behavior decreased when the climate consequences of one option were risky or complex, compared to when personal rewards were risky or complex, controlling for risk and complexity aversion effects. Moreover, complexity showed an asymmetric effect: when applied to climate consequences, it reduced sustainable choices relative to full certainty, but it had little effect when applied to personal reward. A calibrated multi-attribute decision model revealed that participants systematically placed less weight on climate consequences when they were risky or complex, consistent with resource rationality. Our findings demonstrate that sustainable preferences observed in simple and certain contexts may not generalize to real-world environments characterized by uncertainty and complexity. For managers and policymakers, the results suggest that simplifying climate information can promote sustainable investment, consumer, and organizational decisions.

Keywords: Sustainable behavior, Risky choice, Decision making, Climate externalities, Cognitive processes, Multi-attribute utility, Preferences

The Role of Tip-of-the-Tongue States in Explaining Age Differences in State Curiosity

Wednesday, March 18, 11:00 - 12:30, C-Building - N14

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Curiosity in older adults is considered to be an important factor in healthy aging, but uncertainties remain about the mechanisms underlying curiosity in later life. For instance, research on curiosity demonstrates different age-related patterns depending on the measurement approach. Questionnaires about everyday life show that curiosity in older adults is often lower than in younger adults, while experimental studies evoking curiosity in the moment, using materials like trivia questions, often demonstrate higher scores in older compared to younger adults. One potential explanation for this opposing age difference is tip-of-the-tongue (TOT) states, which is the feeling of knowing a word while experiencing an inability to retrieve it. These states occur relatively more often in experimental settings (for 20–25% of trivia questions) than in everyday life (a few times a week according to diary studies). Interestingly, these states are also more frequently experienced in older than in younger adults and positively predict state curiosity. In our presentation, we present results from our study, where we examined the role of TOT states in explaining differences in state curiosity between younger and older adults. 171 older and 171 younger adults were presented with trivia questions; they were asked to guess the answer, indicate whether they experience a TOT state, and report their curiosity about finding out the answer. We expected to see higher levels of state curiosity in older adults than in younger adults, and we hypothesized that this effect would be at least partially mediated by TOT states.

Keywords: state curiosity, tip-of-the-tongue states, aging, trivia questions

Illustrating updated information fails to reduce activation of outdated information

Wednesday, March 18, 11:00 - 12:30, C-Building - N14

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Prior research suggests that outdated information can remain cognitively active during reading, even after it has been replaced by updated content. This persistence may interfere with comprehension. In two pre-registered online experiments, we examined whether illustrating updated information with a picture reduces the activation of outdated information. Participants read short texts in which initial information was later corrected. Within participants, we manipulated whether the updated information was accompanied by a picture or presented without one. To assess activation of outdated information during reading, we measured participants' response times to verification statements related to outdated information. These statements were presented either immediately after the background section or after a target sentence referring to the updated information. If outdated information is activated while reading about updated information, responses to the statements should be faster after the target sentence. If pictures reduce this activation, the effect should diminish when a picture is shown. Contrary to our hypothesis, no such effect emerged: pictures did not influence activation, neither in Experiment 1 ($N = 322$), where updates were presented plainly, nor in Experiment 2 ($N = 357$), where updates were additionally supported by causal explanations. Instead, in both experiments, participants responded faster to verification statements when they followed the target sentence, regardless of whether the picture was presented. These findings suggest that illustrating updated information does not prevent the activation of outdated information. Future research should explore alternative strategies to mitigate interference from previously learned but incorrect information.

Keywords: outdated information, picture presentation, illustrating updated information, reactivation

How Mental Models Constrain What We Learn About

Wednesday, March 18, 11:00 - 12:30, C-Building - N14

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Humans learn from mismatches between expectations and observations. Yet, what counts as a prediction error depends on what is mentally represented – which features are considered relevant and how the environment is believed to be structured. We demonstrate how mental model formation constrains subsequent learning and gives rise to a trade-off between adaptability and effort-minimisation. In two experiments using a hierarchical multi-armed bandit task, participants were assigned to one of two conditions in which either an initially irrelevant feature became predictive (flexible condition) or an initially predictive feature lost relevance (constrained condition) midway through the task. We hypothesised that participants in the flexible condition would filter out the initially irrelevant feature from their representation and thus be blind to an emerging regularity; while participants in the constrained condition would retain the irrelevant feature in the second half and explore its new role. We show that different representational policies – operating under the same error-driven mechanism – produce distinct outcomes consistent with the proposed trade-off: filtering of the initially irrelevant feature increased early efficiency but masked subsequent change in this feature, whereas entertaining a richer representation (i.e., believing the irrelevant feature is relevant in some yet-to-be-discovered way) enabled adaptive insight but required greater exploratory effort. Surprisingly, insight prevalence was comparable across conditions, suggesting that the tendency to simplify or entertain richer models does not solely depend on environmental statistics but individual differences. Our results highlight how mental model structure shapes adaptation.

Keywords: mental models, structure learning, exploration, insight, learning traps

Does Expertise Modulate Automatic Arithmetic Processing? A Stroop Paradigm Approach

Wednesday, March 18, 11:00 - 12:30, C-Building - N14

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The Stroop task is one of the cornerstones of experimental psychology. It has been adapted for use in various settings and domains, providing insights into cognitive control and automaticity of information processing. In a recent study, Keha et al. (2024) asked 55 university students to identify the ink color of mathematical equations. Interestingly, the researchers found that color naming was faster for small equations ($2 \times 3 = 6$) than for large equations ($7 \times 9 = 63$). Additionally, incorrect same-parity equations ($3 \times 2 = 8$) were processed slower than incorrect different-parity equations ($4 \times 2 = 9$). These findings suggest that arithmetic knowledge, which is not necessary for the task, is still automatically activated. In our study, we aimed to replicate and extend this research by investigating whether this automatic activation could serve as an indicator of individual differences in mathematics. Thus, 73 highly educated adults (PhDs, Post-Docs, Professors; 23-63 years, $M = 33.38$, $SD = 8.13$) from mathematics ($N = 40$) and humanities ($N = 33$) had to name the colors of 288 single-digit multiplications. The equations differed in size (small: result <30 vs. large: result >30), correctness (correct vs. incorrect), and the incorrect solutions differed in parity (same-parity: correct solution ± 2 vs. different-parity: correct solution ± 1). Preliminary results could not replicate the effects of equation size or parity. This was true for both groups. Further research is needed to clarify under which conditions automatic activation of arithmetic knowledge happens and if it relates to mathematical proficiency.

Keywords: stroop, mathematics, expertise, individual differences

How experienced agency shapes mental health

Wednesday, March 18, 11:00 - 12:30, C-Building - N14

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Mental health is becoming increasingly important in clinical settings and everyday situations alike. Here I present a study that addresses the role of experienced agency, i.e., the role of subjective experiences of control and authorship over our actions and their consequences, for mental health. For this study, 241 participants completed a survey in which they were presented with specific, challenging situations of a more personal (conflict/stress) or global (climate change/war) nature. Participants were asked to evaluate experiences of control, responsibility and their situational and overall mental health as well as evaluate the helpfulness and use of coping strategies. Via regression and mediation analyses, our data challenge a simple model of direct positive effects of agency experience for mental health in specific, challenging situations. Rather, they point to a crucial role of perceived responsibility that defines when experiences of control affect mental health in a positive or negative manner. Interestingly, our data still confirm a generally positive association between trait assumptions of experienced agency and overall mental health. Thus, interventions aimed at strengthening agency experience may represent a promising avenue for improving mental health especially when they employ measures to target the critical role of perceived responsibility.

Keywords: experienced agency, perceived control, perceived responsibility, mental health, coping

SELTIE: An Experimental Intervention Study on Enhancing Self-Efficacy in Young Adulthood

Wednesday, March 18, 11:00 - 12:30, C-Building - N14

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Young adulthood is marked by a high density of life transitions and developmental challenges. How well individuals navigate these transitions depends considerably on their perceived self-efficacy—the belief in one's ability to achieve desired outcomes. Correlational evidence links higher self-efficacy to better mental health and adaptive functioning, and experimental interventions have been shown to effectively enhance self-efficacy, primarily at the domain-specific level. However, experimental research remains scarce on whether such increases produce long-term preventive effects against mental disorders. The SELTIE study addresses this gap using a randomized controlled design to test the causal effects of a brief cognitive-behavioral training on self-efficacy and mental health outcomes. Young adults with low general self-efficacy but no current mental disorder or planned psychotherapeutic or psychiatric treatment were randomly assigned to either (a) an online group-based self-efficacy training (six 75–90-minute sessions) or (b) an active control condition. Assessments were conducted at baseline, post-intervention, and 12-month follow-up.

The primary experimental manipulation is exposure to the self-efficacy training, with changes in domain-specific and general self-efficacy serving as proximal outcomes. The primary prevention outcome is the incidence of DSM-5 mental disorders over 12 months. This design allows examination of the effects of the intervention on domain-specific and general self-efficacy, as well as on psychopathological symptoms. Data collection started in November 2024. The presentation will outline the experimental design, report preliminary findings available by February 2026, and discuss implications for experimental approaches to personality change and prevention research.

Keywords: self-efficacy, mental health, prevention, young adults, randomized controlled trial, CBT

Modeling compensatory and non-compensatory cue use as continuous differences in subjective weighting of cues

Wednesday, March 18, 11:00 - 12:30, C-Building - N16

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When individuals make inferences based on multiple probabilistic cues, they differ in the extent to which they rely primarily on the most valid cue or integrate cues in a compensatory manner. Traditional accounts attribute non-compensatory decisions to prematurely terminated evidence accumulation or to the use of heuristics that ignore information. However, these accounts are challenged by recent findings on fast, parallel, and bidirectional integration of information as formalized in Parallel Constraint Satisfaction (PCS) models. This project evaluates the PCS sensitivity parameter P , which captures the degree of non-compensatory decision-making by describing how strongly highly valid cues are overweighted relative to less valid cues when objective validities are transformed into subjective weights. A parameter recovery simulation shows that P can be reliably estimated from choices, response times, and confidence ratings given sufficient sample size and diagnostic tasks. Reanalyses of three datasets including 688 participants and 94,792 decisions reveal that participants classified as using non-compensatory heuristics show higher fitted P values than participants classified as compensatory decision makers, indicating stronger overweighting of highly valid cues. A validation study tests whether experimentally induced changes in compensatory versus non-compensatory cue weighting are reflected in P . Overall, the results suggest that P can capture individual differences in compensatory and non-compensatory cue use as continuous variations in subjective cue weighting, consistent with evidence for fast, parallel processing.

Keywords: cognitive modeling, decision-making, cue weighting

Investigating the role of confidence in regulating pre-decisional information search in sample-based decisions

Wednesday, March 18, 11:00 - 12:30, C-Building - N16

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Decisions are almost always preceded by information search aimed at finding the option that is most preferable. How much information one acquires before making a decision should be sensitive to relevant characteristics of the decision situation, such as information costs or decision importance. The confidence with which one wants to make a choice is a plausible candidate for how we can regulate or pre-decisional search amount to adapt to different decision characteristics. To investigate its role, we conducted two experiments (total N of 238) aimed at manipulating participants' general sense of confidence, in which they made binary decisions based on self-truncated information and reported their confidence. In the first experiment, one condition received negatively distorted decision feedback while the other received accurate feedback before completing the remainder of the decisions without any additional feedback. As expected, participants in the distorted-feedback condition collected significantly more information. Mixed-model-analyses indicate that they needed more evidence to reach the same confidence level as the control condition. The second experiment manipulated the ratio of information cost and payoff across two blocks of 60 decisions each such that information was relatively more expensive in the second block. Again, mixed-model analyses indicated that in the second block participants needed more evidence to reach similar confidence levels. Whether and how this might contribute to adaptive behaviour will be the focus of the discussion.

Keywords: confidence, metacognition, information search, judgement and decision making, decision making, sampling

Fixation-Evoked Potentials Reveal Bayesian Belief Updating Processes in Multi-Attribute Choice

Wednesday, March 18, 11:00 - 12:30, C-Building - N16

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Many everyday decisions, such as choosing a new phone or finding the right hotel, require integrating information across multiple attributes. Our recently proposed theory of Multi-Attribute Search and Choice (MASC; Gluth et al., 2024) formalises this process within a hierarchical Bayesian framework, assuming that posterior beliefs about attribute values, and ultimately option values, are iteratively updated through information acquired via fixations. When one option is deemed sufficiently superior, a choice is made. Using EEG and eye-tracking in a multi-attribute choice task ($N = 57$), we explored whether the belief-updating process proposed by MASC is predictive of EEG activity evoked during fixations (fixation-evoked potentials, FEPs). By fitting MASC to the eye-tracking data, we derived predictions of the strength of belief updating at each fixation. Linear deconvolution modelling allowed us to assess the effect of these model-derived estimates, while controlling for overlapping activity from successive fixations and confounds such as saccade amplitude. We demonstrate that MASC not only captures key behavioural patterns, such as the distribution of attention across attributes by importance, but also provides meaningful predictions at the neural level. Regression analyses and threshold-free cluster enhancement revealed two separable dynamics influenced by the predicted strength of belief updating: a P3-like modulation associated with attribute-level updating, followed by a later, centro-parietal positivity associated with option-level updating. Our results provide converging behavioural and neural evidence that multi-attribute decision making involves dynamic, fixation-driven updating consistent with Bayesian inference as formalized by MASC. Furthermore, these model-predicted belief updates are reflected in FEPs with comparable timing and topology.

Keywords: decision making, belief updating, Bayesian inference, eye-tracking, EEG, cognitive modelling

Comparing Frequentist and Bayesian Hypothesis Tests Using Regions of Decision

Wednesday, March 18, 11:00 - 12:30, C-Building - N16

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Statistical hypothesis testing is heavily used in inferential statistics. Yet, hypothesis tests—be they frequentist or Bayesian—have their problems and can cause severe misinterpretations. We argue that one reason for these persistent problems is the following discrepancy: While hypothesis tests are explicit on which effect sizes are theoretically contained in each hypothesis, they usually do not explicitly state which 'true' effect sizes would lead most likely to which test outcome in a practical setting with a certain sample size, measurement error, and between-subjects variability. We make these characteristics explicit by introducing Regions of Decision (RODs). RODs indicate which 'true' effects most likely result in which outcome of a test under specified conditions and are derived from the probabilities of all outcomes of a test. Thus, RODs generalize statistical power calculations to tests with more than two outcomes. RODs allow to quickly gauge which true effects most likely lead to accepting H_0 , accepting H_1 , or to an indecisive outcome. Moreover, RODs provide a basis to evaluate and compare tests. Using RODs, we (a) demonstrate a problem of frequentist but also Bayesian point-null tests, which is known as Meehl's paradox, (b) show that interval Bayes factors—which have previously been championed—suffer from an undesirable bias towards the equivalence hypothesis, and (c) argue that other tests, such as the Bayesian highest density interval with region of practical equivalence (HDI-ROPE) or its frequentist analogue based on confidence intervals (CI-ROPE) might be preferable, because they do not show this bias.

Keywords: Hypothesis testing, Equivalence testing, Bayesian, frequentist, Bayes Factor, HDI+ROPE, Effect sizes

Fast Weighted Compensatory Information Integration also in highly complex decisions that include biasing factors

Wednesday, March 18, 11:00 - 12:30, C-Building - N16

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When all information is openly available in a decision problem and no biasing factors are manipulated, most people apply compensatory strategies in a quick and seemingly effortless manner. Choices thereby approximate closely a rational naive Bayes solution. In a pre-registered study ($n = 212$ participants, total = 55,640 choices), we investigated whether this finding also holds under a) increased complexity of the probabilistic inference tasks (6 vs. 12 cues) and b) if we manipulate processing fluency to include a well established biasing factor. Common decision models were compared in terms of their predictive power for choices, confidence, and decision times per individual. Across all levels of complexity and also when taking into account the fluency manipulation, most participants' behavior (> 70%) was best described by compensatory strategies. We furthermore show that also under such challenging conditions, a Parallel Constraint Satisfaction (PCS) Model of decision making provided the most accurate predictions of participants' behavior. The predictive performance of PCS was thereby close to the upper benchmark provided by applying a machine learning approach to cross-predict the data. Accounting for interindividual differences significantly improved predictive accuracy in both the PCS model and the machine learning model, revealing considerable variation concerning the degree to which participants' choices were affected by processing fluency.

Keywords: cognitive modeling, probabilistic inferences, parallel constraint satisfaction, decision strategies

Posters

* Asterisks indicate presenters

Illusion of Absence: How Occluder Width and Depth Cues Shape Perceived Empty Space

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Observers frequently perceive space behind an occluder as empty even without sufficient evidence, revealing a striking bias in spatial perception – the illusion of absence. This study examined two factors assumed to influence the illusion: occluder width and depth perception. Drawing on the generic view principle, we predicted that narrow occluders would strengthen the illusion. In addition, we expected that monocular viewing – by reducing depth cues – would weaken it. To test these predictions, participants viewed real objects that were resting on a support concealed behind occluders of different widths and under binocular or monocular viewing conditions. Perceived levitation of the objects served as a proxy for the perception of empty space: if the support holding the object behind the occluder is perceived as non-existent, the object may be expected to appear to float. Our findings confirmed both hypotheses: the illusion weakened with wider occluders and under monocular viewing. However, there are fairly large individual differences in the data which warrant further study and explanation. Beyond theoretical implications for the interplay between perception and knowledge in the context of amodal percepts, this work raises practical concerns for high-risk settings such as traffic safety. Upcoming research will explore how the illusion operates in dynamic environments under varying motion patterns, with the goal of identifying factors that further intensify or reduce the illusion.

This project was supported by the Research Council of Norway (Project No. 334817).

Keywords: illusions, illusion of absence, visual perception

Manipulating speed: The effect of speed context manipulation on the localization of dynamic stimuli.

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When asked to localize the onset or offset of a dynamic moving object, systematic biases occur. At stimulus onset, the Fröhlich effect (forward error) is typically observed for fast speeds, whereas the Onset-repulsion effect (backward error) occurs for slow speeds. Conversely, at stimulus offset, Representational Momentum (forward error) dominates for slow to medium speeds, while the Offset-repulsion effect (backward error) emerges at very high speeds. The Speed Prior Account (Merz et al., 2022) offers a unified explanation for these phenomena: It proposes that the perceptual system integrates sensory input with an internal prior expectation of speed. Consequently, perceived speed is "pulled" towards the prior. Stimuli faster than the prior are perceived as slower (resulting in backward shifts/repulsion), while stimuli slower than the prior are perceived as faster (resulting in forward shifts). The three experiments tested whether this internal speed prior is adaptable. We manipulated the experimental context using different speed statistics (blocks with slow vs. fast average speeds). Results show a systematic shift of the localization patterns: The "crossover point" — where biases flip from forward to backward — shifted towards higher speeds in fast contexts and towards lower speeds in slow contexts. These findings suggest that the speed prior is not static but dynamically aligns with the statistical properties of the environment, supporting the predictions of the Speed Prior Account.

Keywords: Motion localization, Speed perception, Speed context, Bayesian Brain, Fröhlich Effect, Representational Momentum

Pupil responses to amodal brightness

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Beyond the amount of incoming light, the pupil light response (PLR) not only reflects the sensory input but rather the perceived features of the stimulus. The pupil has been shown to respond to subjective, illusory, and imaginary brightness as well as modally filled-in brightness in the blind-spot region. We tested the hypothesis that amodally completed brightness would affect the pupil size in a similar fashion. Therefore, we presented three types of stimulus configurations in a randomized order to our participants: The “amodal” configuration should be perceived as a bright figure being partially occluded by a dark fence-like occluder. The “complete” configuration displayed the same figure but un-occluded in front of the occluder. In the “striped” configuration, a striped figure, matched with the “amodal” figure for luminance, would appear as un-occluded in front of the occluder. A stronger pupil constriction to the “amodal” than to the “striped” figure, hence, would indicate that amodal brightness completion contributed to the PLR. Participants were instructed to maintain central fixation and we tracked gaze position and pupil size. As expected, the “complete” condition triggered the strongest constriction. The “amodal” condition elicited a weaker constriction than the “complete” one but a stronger constriction than the luminance matched “striped” control. This highlights another factor that influences the PLR, indicating that even amodally completed surface features are perceptually represented.

Keywords: amodal completion, perceptual completion, pupil light response

What compound figures can tell us about the fast-same effect

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When two figures are judged to be either "same" or "different," "same" responses are typically faster than "different" responses. One explanation for this "fast-same" effect (FSE) relies on dual processes: a fast, holistic process that detects sameness across stimulus dimensions versus a slow, analytic process that checks for differences within stimulus dimensions. However, a competing, parsimonious, one-process explanation exists. The issue remains unresolved due to the difficulty of reliably demonstrating holistic and analytic processing in same-different tasks. To address this issue, we applied the same-different task to a class of figures for which holistic and analytic processes are well-established: classical Navon compound figures. These figures have a hierarchical structure with global and local levels. Global precedence effects in these figures indicate holistic processing at the global level and analytic processing at the local level. Accordingly, an FSE was predicted for same-different comparisons of Navon stimuli at the global level, but not at the local level. The FSE appeared as predicted for global targets but in addition also for local targets when there was global level sameness. This could plausibly be attributed to facilitation of local "same" responses from the global level. Our results clearly demonstrate the role of both analytic and holistic processes in the same/different task, supporting the dual-process theory of same/different judgments.

Keywords: fast-same effect, global precedence effect, holistic processing, analytic processing, compound figures, same-different task

A new method for measuring spatial action effect binding

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Actions and their immediate effects are processed jointly, as shown by extensive evidence. One key finding in this domain is temporal action-effect binding: when actions and slightly delayed effects are causally linked, actions are estimated later and effects earlier than when judged in isolation. This phenomenon has since been observed in a range of causal contexts. It is increasingly framed as being unreliable as an agency indicator, but may rather represent a special case of multisensory integration. If temporal action-effect binding indeed reflects general multisensory processes, this naturally raises the question whether similar binding also occurs in other dimensions, such as space. To investigate this, I propose a new experimental setup that spatially arranges actions and effects while limiting degrees of freedom. On my poster, I present data from two experiments validating this setup and showing significant spatial binding in some conditions. Furthermore, I will point out limitations of the setup and in what sort of situation spatial action-effect binding can not be measured with this method.

Keywords: temporal action-effect binding, spatial action-effect binding, multisensory integration

Visual Awareness and Action: Testing Dual-Task Immunity in Online Corrections to Unperceived Changes

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Humans often act in dynamically changing environments that require rapid motor adjustments, and the motor system is capable of modifying ongoing actions in response to unexpected changes. In their study, Goodale et al. (1986) demonstrated that participants could adjust their pointing movements to compensate for targets that were displaced during saccadic eye movements, even though they were unaware of the displacement. The current study examines whether such adjustments remain robust under cognitive load and systematically tests whether target shifts truly go undetected. To this end, participants perform pointing tasks with gaze-contingent target shifts, under single- and dual-task conditions. In this paradigm, the target is displaced during a saccade and because visual sensitivity is reduced during saccades (saccadic blindness), these displacements typically go unnoticed. In order to test whether the motor system is immune to the dual task interference, hand and eye movement parameters, such as velocity profiles and pointing accuracy, will be compared between single- and dual-task conditions. A separate two-alternative forced-choice (2AFC) task evaluates participants' perceptual awareness to gaze-contingent target shifts. By combining these two tasks, the study aims to clarify how perceptual awareness and cognitive load influences visuomotor control, and preliminary results will be shared to illustrate these effects.

References: Goodale, M. A., Pelisson, D., & Prablanc, C. (1986). Large adjustments in visually guided reaching do not depend on vision of the hand or perception of target displacement. *Nature*, 320(6064), 748-750.

Keywords: Motor Control, Visual Awareness, Multitasking, Perception-Action Model, Dorsal stream, Ventral stream

Conceptual Pre-Activation of Task Stimuli Enhances Action Control Processes

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Perception and action are closely linked, with conceptual knowledge shaping how stimuli are processed during goal-directed actions. According to the theory of event coding, perceptual and response features are integrated into event-files, whose retrieval depends on feature overlap. While attentional manipulations within tasks are known to modulate such feature bindings, it remains unclear whether conceptual activation prior to the task exerts similar effects. In the present study ($N = 228$), we tested whether pre-activating conceptual knowledge enhances distractor–response (D-R) bindings. Participants read a short text describing specific objects either before (experimental group) or after (control group) completing a DRB task involving exemplary stimuli. In the task, participants responded to a frame around distractor images, allowing assessment of D-R binding based on repetition versus change of distractors and responses across prime–probe trials. The experimental group showed stronger DRB effects, particularly in error rates, indicating enhanced integration and retrieval of distractor–response bindings following conceptual pre-activation. These findings suggest that prior conceptual activation, much like attentional focus during task execution, strengthens perception–action integration and affects subsequent behaviour.

Keywords: action control, semantic priming, event-file, feature binding and retrieval, stimulus processing, perception-action integration

Motivation und Unterstützungsbedürfnisse im Ausdauersport: Eine Studie im Ultra-Trail-Running

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Über Beweggründe im extremen Ausdauersport ist wenig bekannt. Marathonathleten zeigen vier Motivkategorien: Gesundheitsorientierung, Coping, soziale Motive und Wettkampforientierung (Stoll et al., 2000; Mendez-Alonso et al., 2021). Die vorliegende Studie untersuchte Beweggründe im Ultra-Trail-Running und zentral Bedürfnisse der Athleten für Unterstützungsteams (Optimal Matching Theory, OMT; Cutrona, 1990). Untersucht wurden die motivationalen Profile von Ultra-Trail-Läufern sowie deren psychologisch-praktischen Bedürfnisse in der Betreuung. Anhand eines Mixed-Methods-Ansatzes wurden die Motive von 68 Athleten (Anfänger, Fortschgerittene, Experten) erfasst (35,3 J.; $n = 29$ weibl.; Motivation of Marathoners Scale, Wertebereich 1-7; Masters et al., 1993). In einer Unterstichprobe wurden sechs leitfadengestützte, problemzentrierte Interviews durchgeführt (32,1 J.; 1 weibl.), um hypothesengenerierend Bedürfnisse zu erfassen. Ultra-Trail-Running-Athleten im Gegensatz zum Marathon die stärksten Ausprägungen für Naturverbundenheit ($M = 5,08$), Selbstwert ($M = 4,64$) und persönlicher Zielerreichung ($M = 4,60$) während soziale Motive (Anerkennung; $M = 2,57$) und Wettkampforientierung ($M = 2,63$) die geringste Ausprägung zeigten. Einfaktorielle ANOVAs für Erfahrung ergaben einen Gruppeneffekt nur für Wettkampforientierung ($F(2;25,3)=9,11$; $p < .001$). Post-hoc-Tests zeigten, dass nur Experten eine niedrigere Wettkampforientierung aufwiesen als Anfänger ($p < .05$) und Fortgeschrittene ($p < .01$). Mit Unterstützungscrow zeigen Athleten höhere Werte in Wettkampforientierung ($t(66)=2,17$; $p < .05$) und persönlicher Zielerreichung als ohne Crew ($t(66)=2,09$; $p < .05$). Unterschiedlichen Motivausprägungen wurden durch Inhaltsanalyse (Mayring, 2000) der Interviews bestätigt. Während teilweise die Eigenständigkeit betont wird, zeigt sich übereinstimmend mit der OMT eine hohe Bedeutung der bedarfsorientierten sozialen Unterstützung (z.B. Motivation, Bestätigung, Orientierung) neben taktischen und materiellen Aspekten. Die Leistungsmotivation im Ultra-Trail-Running unterscheidet sich vom Marathon. Individuelle psychologische Bedürfnisse sind zentral für eine optimale Unterstützung und damit für Crewing-Strategien.

Keywords: Motorik, Leistung, Motivation, Emotion, Soziale Interaktion, Sport

From Flowers to Matches: Category, not Valence, Drives Spatial Compatibility Effects

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Spatial stimulus-response compatibility (SRC) refers to the robust finding that responses are faster and more accurate when stimulus and response locations are compatible (e.g., right stimulus-right key) than when they are incompatible (e.g., right stimulus-left key). However, a different pattern emerges with affectively valenced stimuli, such as flowers and spiders: When participants categorize stimuli as positive or negative, performance is better for positive-compatible and negative-incompatible stimulus-response mappings than vice versa, producing a reversed SRC effect for negative stimuli. This valence-by-compatibility interaction has been attributed either to approach/avoidance tendencies or to differences in the ease of selecting the specific stimulus-response mapping.

In the present study, we compared a valence-based Category-Compatibility Assignment Task (with flowers and spiders) with a same-different version of this task, in which participants responded based on whether two stimuli matched or mismatched in category, independent of valence. We observed a significant category-by-compatibility interaction in both tasks. Notably, the interaction was stronger in the same-different version, with comparable responses to pairs of flowers and pairs of spiders, demonstrating a remarkable lack of influence of affective valence. Taken together, our results challenge the approach/avoidance account and instead suggest that spatial compatibility effects are primarily driven by the meaningful alignment between stimulus category and response mapping, rather than by the affective valence of the stimuli.

Keywords: Spatial Stimulus-Response Compatibility, Affective Valence, Category Matching

The Impact of Affect and Aspirations on Risk Proneness: An Experimental Study

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This study examined whether performance feedback relative to self-set aspirations shapes subsequent risk proneness through emotional responses and whether dimensions of the achievement motive condition these effects. Drawing on reference dependent theories such as prospect theory and the risk as feelings framework, aspirations were treated as task-specific reference points, where exceeding or failing to meet them elicits affect that shapes subsequent risk proneness. In an online experiment, participants ($N = 469$) set an intelligence quotient aspiration, completed an intelligence test, and then received manipulated feedback indicating performance substantially above or below the aspiration. Risk proneness and positive and negative affect were measured before and after feedback; the achievement motive hope of success and fear of failure were assessed at baseline. Results show that performance feedback relative to self-set aspirations influenced subsequent risk proneness. Failed feedback reduced risk proneness after controlling for baseline differences. Mediation analysis revealed that this relationship operated through affective pathways. Positive affect increased and negative affect decreased risk proneness, with both indirect effects statistically robust. Fear of failure modulated the size of the emotional shift primarily when success was signaled. These results suggest that aspirations operate as reference points whose impact on risk runs largely through affective processes in evaluative, identity relevant settings. The study contributes to theories of risk and motivation by integrating emotional mechanisms into an achievement context, clarifying when reference dependence and goal setting translate into shifts in perceived willingness to engage with uncertainty.

Keywords: Risk Proneness, Affect, Aspiration, Performance Feedback, Achievement Motives

Exploring valence and reinforcement in control illusions

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The illusion of control refers to the phenomenon of feeling in control over an outcome that is not caused by our action. It shows, for instance, in the outcome density bias (ODB): Participants often judge that they have more control over non-contingent action outcomes when the overall frequency of outcomes is high rather than low, for example when winning frequently rather than rarely in gambling. It has been shown that desirability of an outcome is positively associated with control ratings and the ODB. In the contingency learning paradigm by Alloy and Abramson (1979), the impact of desirability of outcomes on the ODB has exclusively been demonstrated by adding/ subtracting points associated with monetary, extrinsic reinforcement (e.g. Alloy & Abramson, 1979, Exp. 2). In our study we systematically varied and combined (a) intrinsic valence of outcomes (positive valence: jumping over a precipice; negative valence: falling into a precipice) and b) extrinsic reinforcement (gaining/ losing points) in an online gamified version of a contingency learning task in which there was no contingency between actions and outcomes. Preliminary results show an increase in perceived control with the introduction of reinforcement, especially in the negative valence in which the aim was to prevent falling into the abyss and losing points.

Keywords: control illusion, reinforcement, valence, intentionality

Developing a Paradigm for Studying Gaze-Based Indicators of Bluffing and Confidence in Winning under Monetary Incentives in Dyadic Interactions

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Modern eye-tracking has advanced research on gaze behavior in realistic social interactions. It was already shown that blinking frequency and duration both increase during deception (George et al., 2017), in states of joy (Moharana et al., 2021), or in mutual gazing (Cakir & Huckauf, 2023). Card games provide an ideal framework to study social interactions by offering both experimental control and ecological validity, particularly regarding bluffing and confidence in winning. To further investigate factors that may influence gaze patterns in these settings, we introduce a condition involving stakes as monetary incentives, which should enhance engagement (Camerer & Hogarth, 1999). As the primary contribution of this study, we developed a paradigm to examine whether and how bluffing and confidence in winning can shape gaze signatures and how these signatures are modulated by monetary incentives. Furthermore, it is hypothesized that blink frequency and duration are expected to increase during both bluffing and confidence in winning.

The game is played by two participants face-to-face on a touch-screen table to ensure standardization. Participants play 64 trials within 4 blocks, two with and two without monetary incentives. The cards are being distributed selectively to ensure confidence in winning or in losing, respectively, and to vary the necessity to bluff. In the incentive condition, participants receive lottery tickets for each win, increasing their chance of winning monetary prizes. This within-subject design shall be executed with 40 participants. Eye movements and blink behavior are tracked using eye-tracking glasses (Pupil Labs Neon).

Keywords: Eye-Tracking, Gaze Behavior, Dyadic Game, Monetary Incentives, Bluffing

Robust Individual Differences in Real-World Speed Perception

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Humans internalize expectations about how quickly real-world events should unfold: When a tennis serve leaves the racket, we form expectations about how quickly it should cross the court. Here, we tested whether individual differences in such expectations give rise to idiosyncrasies in judging the speed of dynamic real-world videos. Participants viewed 50 videos depicting situations from five different sports. Each clip started at a random playback rate (0.5x–2x), and participants adjusted the rate until it looked most natural. On average, observers selected playback rates below the veridical speed, indicating a general tendency to perceive slower-than-actual speeds as most natural. Individual differences in natural-speed adjustments were reliable: The tendency of a participant to over- or underestimate speed in one half of trials was robustly correlated to their tendency to over- or underestimate speed in the other half of trials. Probing into potential sources of these individual differences, participants also reported their daily exposure to each sport and their time-perception traits using the Individual Time Span Scales (ITSS). Individual exposure to the sports did not predict idiosyncrasies in speed adjustments. By contrast, the ITSS fast time-span orientation was positively correlated with speed adjustments: People who reported a generally faster sense of time chose faster "natural" speeds; people with a slower sense of time chose slower "natural" speeds. Our results (1) reveal robust individual differences in real-world speed perception, and (2) show that these differences are linked to individual tendencies in time-span orientation which may shape expectations about the unfolding of natural events.

Keywords: speed perception, individual differences, dynamic visual stimuli

A Short Social Stress Paradigm for Repeated Assessment of Subjective and Physiological Stress Responses in Youth

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Altered stress reactivity has been linked to psychopathology and is a central focus of biopsychosocial research. Established social stress paradigms reliably induce both subjective and physiological stress responses, and recent research suggests that these paradigms can be administered repeatedly without strong test–retest effects. However, existing research is mostly limited to adults, short time intervals, and few measurement points. The application of social stress paradigms in longitudinal studies that are broad in scope and involve children and adolescents is limited, typically due to their length, complexity, and resource demands. Consequentially, developmental changes in stress responses across childhood and adolescence remain poorly understood. We developed a hybrid social stress test that combines computer-based tasks with a real social interaction component, specifically designed for use with children and adolescents. The paradigm is optimized for repeated application and minimal experimenter involvement, making it suitable for large-scale longitudinal studies. It is currently implemented in an ongoing longitudinal study with six assessments over 2.5 years, including minors from clinical contexts and the general population. We present the test design, repeated-measure variations, and technical tools for assessing subjective responses and physiological biomarkers (e.g., autonomic and HPA-axis indicators), along with the temporal sequence of their implementation within the experimental protocol. In the future, we aim to address three questions: (1) whether and how repeated administration of the test reliably induces stress in children and adolescents, (2) how stress reactivity develops across time, (3) how this development relates to the emergence of psychopathology in youth.

Keywords: Social stress test, stress reactivity, children and adolescents, development, longitudinal research

Close to the Excluded Pentagon: How Five-Year-Olds React to Abstract Primes of Ostracism

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We tested whether five-year-old children react differently to abstract primes of social exclusion. Children first watched videos of geometric figures that either showed exclusion or did not. Afterwards, children could choose to sit in close proximity to either the previously excluded figure (i.e., target) or a figure that had previously engaged in exclusion (i.e., source). In the social exclusion condition, we found that more children than expected by chance preferred to sit next to the target. In the control condition, the number of children who chose to sit next to the single figure was as expected by chance. In addition to previous studies at preschool age, the current results suggest that when primed with social exclusion, 5-year-olds show affiliative-related behavior not only towards people but also towards abstract shapes. This may indicate robust effects of ostracism priming, as well as children's flexibility in responding meaningfully to static versions of abstract primes.

Keywords: ostracism, priming, abstract primes, affiliative-related behavior, visual perception

What sticks and what doesn't: How do children process irrelevant information?

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The binding and retrieval in action control framework (Frings et al., 2020) proposes that stimuli, responses, and subsequent effects are bound together into a common representation such that the recurrence of any of these features can trigger the retrieval of the remaining ones. Developmental research suggests that children show stronger but less flexible, or stickier, bindings than adults. With age, children use bindings more efficiently and show less difficulties when features only partially overlap across subsequent trials. Even task-irrelevant features (i.e., distractors) can be bound to responses. Research in adults has shown that such retrieval decreases as distractor similarity across subsequent trials increases (Schöppe et al., 2020; Singh et al., 2016). Little is known about the extent to which comparable distractor effects are present in children. The present study tested the hypothesis that, due to a tendency to overgeneralize, younger children may exhibit greater binding effects at higher distractor dissimilarity than older children and adults. We examined age-related differences in distractor-response bindings in 4- to 10-year-olds ($N = 95$) and adults ($N = 40$) performing a two-choice response task. Preliminary results showed no differences in binding effects between children and adults as reflected in response times and both in children and adults, retrieval decreased with increasing distractor dissimilarity. However, this effect was stronger in younger children than in older children. These findings suggest that while effects of binding and retrieval are established early, the efficiency of retrieval possibly continues to develop throughout childhood.

Keywords: binding and retrieval, children, development

Interactions of Modality and Emotion: The Complex Effects of Threat on Attentional Control

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Attentional control is often challenged by emotionally charged stimuli, especially threats. While most prior research has relied on static images, real-world threats are dynamic and multimodal, our study explored the impact of the more ecologically valid, multi-modal threat distractors (static pictures, muted video, audiovisual video) on the performance of visual search. 48 participants performed a visual search task consisting of a number matrix where they had to find numbers starting from number 1 in an ascending order while ignoring the randomised presentation of task-irrelevant neutral or threatening weather related stimuli. We recorded initial attentional capture (time to find number 1) and sustained executive control (elapsed search time for numbers 1-10). The results showed that finding the first target took longer with a threatening picture distractor compared to a neutral picture, and participants were faster in picture modality compared to both audiovisual and muted video stimuli (regardless of valence). Furthermore, participants completed the task (i.e., found all numbers) faster in the threatening muted video compared to neutral one, however, threatening audiovisual distractors resulted in worse performance compared to neutral audiovisual one. These findings highlight the nuanced interplay between emotional salience and sensory modality, showing that the modality of threat information can either hinder or enhance attentional control.

The perceptual load from movement and sound might be able to override or even reverse the typically negative effects associated with threats thereby underscoring the need to focus on non-static imagery to obtain an accurate understanding of attentional processes.

Keywords: visual perception, executive control, attentional capture, visual working memory, task-irrelevant distractors

The attenuating effect of foreknowledge on auditory distraction depends on linguistic pre-processing of the spoken sentences

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Previous studies have shown that the disruptive effect of task-irrelevant speech on short-term memory can be attenuated by providing intelligible foreknowledge of the specific distractor materials. However, it is yet unclear whether this benefit results from familiarity with the sound of forthcoming distractors or whether it is due to reduced interest in the semantic content or syntactic structure of the irrelevant utterances to be presented, thus reducing stimulus-specific attentional capture. This was tested in the present study by providing literal foreknowledge of task-irrelevant spoken sentences either in the same or a different language (German or English). Crucially, half of the participants (German sample) were familiar with both languages while the other participants (UK sample) were unfamiliar with one of the languages. Participants were instructed to listen to the sentences during the foreknowledge period and to ignore the sentences during the memory task. It was found that both German and English foreknowledge reduced auditory distraction in German participants, when presented with the same irrelevant speech materials during the memory task. In contrast, the UK sample benefited only from English foreknowledge presented prior to English irrelevant speech. These results suggest that foreknowledge reduces the degree of attentional capture elicited by semantic or syntactic properties of irrelevant speech, whereas it seems to have no effect on the distraction due to the acoustic properties of the distractor sound.

Keywords: irrelevant sound effect, auditory distraction, foreknowledge, attentional capture, semantic processing, language

Every Move I Make: The Relationship between Metacognition and Motor Performance in Guitar Playing

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Metacognition, the ability to monitor and control one's cognitive processes, is widely regarded as beneficial in different educational settings, resulting in improved academic outcomes in knowledge-based tasks. However, the role of metacognition in procedural tasks is less clear. While many processes, such as motor adaptation — the online adjustment of a movement to reach an intended goal — occur automatically without the need for conscious monitoring, other research suggests that elite athletes have superior motor metacognitive skills; and that metacognition plays an important role in music education. Using guitar playing as an ecologically valid task to study motor control, this study investigates the relationship between metacognitive and motor performance. Specifically, we address two gaps in the current literature: the assumed but untested link between metacognition and motor performance and the relationship between metacognition and the presumed unconscious nature of motor adaptation. We hypothesize that monitoring will be positively correlated with motor performance and inversely correlated with motor adaptation.

We tested these hypotheses using secondary data from 52 amateur guitarists who completed a novel paradigm in which they monitored their finger movements while playing single notes on a guitar neck. Sensor-based movement data allowed us to quantify motor performance; and participants' identification of instances of altered feedback on their finger position, together with their confidence in their responses, allowed us to measure the precision of metacognitive judgments (m-ratio). Ultimately, this research seeks to advance our understanding of how metacognitive processes shape skilled motor performance in applied contexts such as guitar playing.

Keywords: Motor metacognition, motor control, motor adaptation, m-ratio

Does motor hysteresis apply to full-body posture planning?

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In predictable tasks, such as opening drawers in ordered sequences, individuals persist in prior postures, indicating a reuse of prior motor plans to reduce planning costs (Rosenbaum et al., 2007). This posture hysteresis so far has only been demonstrated for arm movements. The present study examined whether hysteresis constitutes a general planning principle that extends to full-body movements. Twenty-four participants (age 23.5 ± 3.7 (SD) years, 12 male) performed a full-body hysteresis task. On each trial, they walked 5m from a start to a target position. Midway, a horizontal bar served as an obstacle at one of 11 heights. Participants decided whether to step over or duck under the bar. Bar height was varied in ordered sequences (ascending/descending) to induce hysteresis, and decisions were recorded as the dependent variable. A generalised linear mixed model (logit link) was applied to the decisions, with 'bar height' and 'order' (ascending/descending) as fixed effects. Significant main effects emerged for 'bar height', $z = +11.830$, $p < .001$, odds ratio (OR) = 4.648×10^7 , and 'order', $z = -2.007$, $p = .045$, OR = 0.476. Participants stepped over lower bars and ducked under higher ones. The point-of-change differed between orders: bar height 6.9 for ascending vs. 7.1 for descending sequences. The shift direction indicated anticipatory rather than persistent postural adjustments. Thus, we were unable to demonstrate persistence as a planning principle for full-body movements, possibly due to the high mechanical costs involved, which tend to reduce the hysteresis effect (Schütz and Schack, 2013).

Keywords: motor hysteresis, plan reuse, full-body, posture selection

The grammar of the gallery: Do walls and corners influence categorization of visual information surrounding the viewer?

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In informal learning settings the important information often is arranged all around the visitors. For example, thinking of a museum or a historical place, more or less impressive architecture comes to ones mind with galleries, where exhibits are arranged all over the walls and throughout the rooms. A series of experiments showed that the arrangement of the information on the walls of a room influenced memory for related pieces of information. Now an experiment (pre-registered, based on a power analysis) will examine if the architectural features of a room, namely walls and corners, also influence how visitors categorize the presented information: Using AI, artworks were created belonging to four different styles (painting, photorealistic, animé, low poly) and four different motifs (portraits, landscapes, stilllives, genre). Participants wearing HMD glasses will explore a virtual room with 24 artworks on the four walls sorted wallwise either by style or motif (between). Afterwards they have to rate similarity of new pictures that either show the same motif but different styles or are of the same style but show different motifs. It is expected that participants are more aware of the categories according to which the artworks in the room were sorted wallwise and therefore will judge similarity depending on these categories: After exploring a room with pictures sorted wallwise by motif (vs. style) two pictures presenting the same motif (vs. style) should be rated similar more often. Findings could help to understand how rooms may structure the cognitive processing of information.

Keywords: Virtual reality, informal learning, spatial arrangement, architecture, similarity rating

Highly automated vehicles' implicitly and explicitly communicated intents to interact with pedestrians and pedestrians' appraisals across different cultures

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Research has shown that highly automated vehicles (HAVs) pose new challenges for safe interactions with pedestrians in mixed-traffic scenarios, particularly regarding how vehicle intent is communicated. Such intent can be signaled implicitly by vehicle kinematics and/or explicitly by using external human-machine interfaces (eHMIs) such as light-bands on the vehicle's exterior. However, studies providing deeper understanding of the interplay of implicit and explicit signals for HAVs' communications with interacting pedestrians and especially comparable across different cultures are missing. But that is exactly what is missing essential for developing a universal design and standardized guidelines here. To bridge this gap, our experimental online study replicated previous experiments from Germany, Japan, and Singapore now with Dutch and British samples to examine the generalizability of eHMI effects across cultures. Participants were presented with HAVs varying in explicit (intention-based eHMI, static eHMI, none) and implicit communication style (yielding, non-yielding). We assessed pedestrians' willingness to cross (WTC), perceived safety, and perceived trustworthiness and support of the eHMI. Results across all five samples revealed similar patterns: intention-based light-bands significantly increased WTC and perceived safety compared to static or absent eHMIs, and were rated as more trustworthy and supportive. However, when explicit and implicit signals contradicted each other, participants showed potentially dangerous overreliance on the explicit signal. The national samples differed slightly in the extent of this overreliance. These findings emphasize both promises and risks of light-band eHMIs and underscore the need for universal, standardized design guidelines that mitigate overreliance while enhancing pedestrian safety in mixed-traffic environments.

Keywords: Automated Vehicles, Traffic Safety, Human-Machine Interaction

Investigating Event File Coding by Means of Vibrotactile Cues in Virtual Reality

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This virtual reality study examined the potential of vibrotactile signals to assess their suitability for investigating event file coding in purposeful movements. Building on Hommel's original paradigm, the experiment transferred the concept from a traditional visual setting to an immersive VR environment, where cues and responses were executed through natural hand movements rather than keypresses. Vibrotactile stimuli were delivered via a custom-built, wireless vibration module attached to the palm, capable of transmitting directional vibrations (up, down, left, right). Each trial comprised a visual cue, two vibrotactile stimulation phases (S1, S2), and their corresponding reaction phases (R1, R2). R2 was of particular interest, as it evaluated how previously established event files—temporary bindings between sensory and motor features—influenced response speed and accuracy. Three binding conditions were implemented: CompatibleSame (feature repetition), CompatibleNotSame (feature change), and Incompatible (partial feature repetition). The results revealed significant performance differences across conditions. CompatibleSame yielded fastest reaction times and lowest error rates, indicating strong priming and repetition benefits. CompatibleNotSame produced slower responses and higher error rates, likely reflecting cognitive effort required to form new bindings. In the Incompatible condition, residual influences of prior associations persisted, affecting performance. Analysis of hand and eye movements supported these findings, showing effective reformation of event files in CompatibleNotSame, while Incompatible maintained traces of earlier bindings.

Overall, the study demonstrates that vibrotactile cues in VR offer a powerful tool for probing event file processes, with binding compatibility exerting robust and measurable influence on both behavioral outcomes and motor control.

Keywords: Event File Coding, Vibrotactile Stimulation, Virtual Reality (VR), Feature Binding, Sensorimotor Integration

The Influence of Context Switch Rate on the CSPC Effect in the Stroop Paradigm

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Cognitive control is essential for executing goal-directed behavior and is shaped by multiple factors, one of them being context. Contextual information influences which stimuli features are selectively attended to and prioritized for processing. The context-specific proportion congruency (CSPC) effect refers to the observation that the magnitude of the congruency effect is modulated by the proportion of congruent versus incongruent trials within a given context. Typically, larger congruency effects are observed in contexts with a high proportion of congruent trials (80% congruent) compared to contexts with a low proportion of congruent trials (20% congruent). The present study investigates whether the magnitude of the CSPC effect in the Stroop task is influenced by the frequency of context switches. To this end, we manipulated the switch rate between contexts by creating conditions with either a high or low proportion of context switches (80% vs. 20% switches). The results indicate that a substantial CSPC effect emerges when context switches are infrequent (20% switches), whereas a high frequency of context switches (80% switches) eliminates or even reverses this effect. These findings suggest that the volatility of context transitions shape the acquisition of control policies. Frequent context changes might impair the formation of context-congruency associations and participants may instead form associations at the item level and connect each item with its associated proportion of congruency. These findings indicate that when contexts are unstable, participants may struggle to adapt to conflict and identify task-relevant stimulus features, emphasizing the importance of contextual stability for effective attentional allocation.

Keywords: Context-specific proportion congruency effect (CSPC), context switch rate, context stability, cognitive control

Temporal cueing of conflict reduces congruency effects in the Eriksen flanker and Simon tasks

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Congruency effects can be reduced when cues indicate high conflict between targets and distractors in conflict tasks. However, it is unclear how such effects are modulated by implicit temporal cues, as previous studies have revealed different results depending on the specific conflict task (Eriksen flanker vs. Simon task). To address this issue, in the present study short and long foreperiods (FPs) were associated with high or low conflict probabilities in classical two-choice versions of the Eriksen flanker and Simon tasks. In contrast to previous findings, congruency effects in mean reaction time were reduced with conflict-predicting FPs not only in the Eriksen flanker but also in the Simon task. However, in the Simon task, this modulation appeared irrespective of whether the short or the long FP indicated high conflict probability, whereas in the Eriksen flanker task, the modulation only appeared when conflict was associated with the long FP. Overall, the present study shows that conflict-predictive FPs can generally reduce congruency effects across different types of conflict tasks, even though the temporal dynamics in the modulation of the congruency effect may be task-specific.

Keywords: congruency effect, conflict tasks, cognitive control, temporal processing

Qualitative Differences in Conflict Tasks: Evidence from a “Simon x Stroop” Paradigm

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There exists a taxonomy for various conflict tasks based on the dimensional overlap between the stimulus and/or response dimensions and their relevance for task performance (e.g., see Kornblum et al., 1990). For example, the standard Simon task is classified as a Type 3 task. This task type generates a stimulus-response (S-R) compatibility effect due to dimensional overlap between the irrelevant stimulus dimension (location) and the response dimension (left or right button-press). In contrast, the manual Stroop task is classified as a Type 4 task. This task type generates a stimulus-stimulus (S-S) congruency effect due to dimensional overlap between the relevant (color) and irrelevant (color word) stimulus. According to the serial-stages model, the Stroop effect originates in an initial stimulus identification stage, while the Simon effect originates in a final response selection stage (Kornblum, 1994). To investigate whether different types of conflict tasks are indeed qualitatively different, we employed a variation of the paradigm used in Kornblum et al. (1999) and applied an advanced distributional approach in analyzing time-to-event data, namely event history analysis (EHA). Comparing Type 3 (Simon; S-R compatibility), Type 4 (Stroop; S-R compatibility), and Type 7 (Simon x Stroop; S-S and S-R compatibility) tasks in the same set of participants, with 100 trials per participant and condition, allowed us to track the behavioral dynamics in each task. In particular, while mean reaction times suggested additivity of effects, we identified differences in onset times, durations, magnitudes, as well as temporal overlap and seriality of effects in each conflict task.

Keywords: Simon effect, Stroop effect, distributional analysis, event history analysis, compatibility, conflict

Control Dilemmas Exist on Different Levels of Information Processing: Flexibility and Stability Trade off at the Task Level

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Our cognitive system must manage two opposing demands: staying focused on one task (stability) and switching between tasks when needed (flexibility). Traditionally, a trade-off has been assumed between these two control modes. Recent studies questioned this idea. However, they do not consider that experimental manipulations can influence stability and flexibility at different levels of information processing and that a trade-off may only exist within the same level. We introduce a novel paradigm designed to investigate flexibility and stability at different levels of information processing (task vs. stimulus level). Participants switched between two categorization tasks while ignoring distractors. Distractors either came from the same (within-task) or the alternative task (between-task) and were either response-congruent or incongruent. In Experiments 1 and 2, participants categorized words superimposed on distractor images representing the generic response categories (task level interference). In Experiment 3, they categorized letters or digits flanked by distractor letters or digits (stimulus level interference). Reduced interference from between-task distractors compared to within-task distractors in Experiments 1 and 2 show shielding at the task level. At the stimulus level (Experiment 3) both distractor-types interfered to the same extent, indicating that the shielding against between-task distractors got bypassed by the automatic retrieval of learnt stimulus-response associations. Across all three experiments, shielding against between-task distractors in the previous trial improved subsequent performance, when the task repeated (i.e. it improved stability), but impaired performance, when the task switched (i.e. it impaired flexibility). This finding supports a trade-off between flexibility and stability at the task level.

Keywords: cognitive control, flexibility, task switching, trade-off, distractor

Multilevel Dynamics of Cognitive Control Style: Interactions Between Trial Feedback, Task Context, and Individual Differences

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Metacontrol describes the regulation of cognitive control along a continuum between flexible and persistent cognitive control styles. Within this framework, the cognitive control style can change on multiple timescales: rapidly from trial to trial, across intermediate task contexts, and as relatively stable individual tendencies. Previous work using a flanker task with embedded reaction-time feedback has shown that trial-specific feedback influences performance on the subsequent trial and that individuals differ in how they prepare for upcoming trials depending on feedback in the previous trial at the neurophysiological level. However, it is still unclear how experimentally induced control contexts interact with these short-timescale and interindividual effects. In the present study, we investigated how block-level manipulations of control demands influence cognitive control style and its trial-by-trial adjustments. Participants performed a flanker task with reaction-time feedback across blocks that differed with regard to their congruency proportion. Blocks with mostly congruent trials were designed to induce a more flexible control style, whereas blocks with mostly incongruent trials were designed to promote a more persistent style. This approach allows us to examine how immediate feedback-driven adjustments unfold within broader control contexts and how these patterns vary between individuals. Preliminary results suggest that the expression of trial-by-trial adjustments depends systematically on block context, with indications of reduced adjustments under persistence-promoting conditions. Taken together, the findings support the view that cognitive control styles are shaped concurrently by momentary feedback, intermediate task structure, and interindividual differences.

Keywords: cognitive control, EEG, conflict, flanker task, feedback

The role of working memory for task-order coordination and coordination adjustment in dual-task situations

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Performing two tasks simultaneously requires the coordination of their processing, especially in dual-task contexts with varying task orders. When task-order changes across trials, coordination demands result in performance impairments on trials with order switches relative to trials with order repetitions (i.e., order-switch costs), reflecting task-order representations maintained in working memory. Previous research has further shown that task-order coordination adjusts to prior experience with task-order switches versus task-order repetitions. Order switch costs in current trials (N) were reduced when the preceding trial (N-1) involved a task-order switch relative to task-order repetition. However, evidence for the assumed involvement of working memory resources in such sequential adjustment remains inconclusive. The present study investigates how working memory contributes to task-order coordination and adjustment by combining dual tasks with varying task orders and manipulating load through an additional working memory task. In detail, participants performed a visual-auditory dual-task paradigm involving letter and tone discrimination. Working memory load was varied via an additional updating task: Under high-load conditions, participants were required to maintain a number in working memory while continuously performing an arithmetic operation. Under low-load conditions, the same arithmetic operators were presented as fixation marks, without requiring the execution of an actual calculation. The results are interpreted and discussed in the context of current research on task-order coordination, coordination adjustment, and working memory.

Keywords: PRP, Dual tasks, Dual-task coordination, Task-order coordination, Coordination adjustment, Working memory, Executive functions

Sequential changes in reward prospect modulate cognitive control even with implicit learning of reward cues

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Reward prospect modulates cognitive control, promoting either more stable or more flexible behavior depending on the immediate reward history: Previous studies have shown that specifically remaining high reward prospect enhances stability, as reflected by reduced voluntary task switching. However, it remains unclear whether sequential changes in expected reward magnitude influence only conscious control processes or also affect behavioral stability without explicit awareness of these changes. In this study ($n = 42$), we used a voluntary task-switching paradigm with cues announcing varying reward prospects. However, the meanings of the cues, indicating either high or low reward magnitude, were not explicitly instructed to participants. Results showed that participants nevertheless learned the cue meanings, as they responded faster on high-reward trials than on low-reward trials. In addition, sequential changes in reward prospect influenced behavioral stability, with participants switching tasks less frequently, specifically on "remain high" trials. These findings confirm previous results with explicitly instructed reward cues, but suggest that cue meanings can be acquired implicitly, as participants were unable to report them verbally.

Keywords: cognitive control, voluntary task switching, reward, implicit learning

Cognitive Flexibility with Self- versus Externally-Determined Task Choice

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Cognitive control—the ability to regulate one’s behavior in accordance with internal goals—is fundamental to adaptive behavior. Despite substantial progress in our understanding of different cognitive control functions supporting goal-directed behavior, most studies rely on externally instructed tasks, whereas in real-world contexts, people often have the autonomy to choose which task to perform. Although research suggests that having the opportunity to choose can enhance a variety of psychological processes (e.g., motivation or learning), it remains unclear whether and how cognitive control differs between instructed and voluntarily chosen tasks. The present study addresses this question using a novel paradigm to investigate how one core function of cognitive control—the flexibility to switch between tasks—differs between self-determined (free-choice) and externally determined (forced-choice) tasks. We reasoned that self-determined task choice may enable individuals to optimize control more effectively (e.g., by switching when control demands are relatively low) and/or may motivate individuals to invest more effort in flexibility-related control processes. Consistent with performance optimization and motivational accounts, switch costs in task performance (in particular, reaction times [RTs]) were reduced under free-choice compared to forced-choice tasks across multiple experiments. This reduction was driven specifically by shorter RTs on switch trials in free-choice tasks, suggesting that voluntary task choice takes advantage of control processes that promote cognitive flexibility, such as disengaging from a previous task or reconfiguring a new one. Overall, the present study provides new evidence linking self-determined task choice to improvements in higher-order cognitive control functions—specifically, cognitive flexibility.

Keywords: voluntary task switching, cognitive control, flexibility, volition

Improving improvement: patterns of learning in practice

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“Practice makes perfect” is no mere idiom. Practice has been shown to significantly improve performance in almost all domains tested (For review see Macnamara, Hambrick & Oswald, 2014; Heathcote, Brown & Mewhort, 2000). While this improvement is well-documented, the mechanisms by which this improvement occurs are still poorly understood. This project seeks to test the idea that the primary driver of improvement via practice is simple memorisation of stimulus-specific features, and does not reflect a more general improvement in the task. I present the results of an experiment showing that the performance improvement following extensive training on a novel task was highly specific to stimuli with direct featural overlap to those practiced. Moreover, only exactly practiced stimuli reached maximal performance, even when compared with stimuli where all the components received substantial practice. These results suggest that mastery in a task stems from specific practice of a finite number of stimuli, not general task improvement.

Keywords: improvement, practice, expertise, automaticity, learning

Learning Under Load: The Impact of Varying Numbers of Pictures on Multimedia Learning in Adolescents

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In multimedia presentations, the combination of images and text helps students effectively acquire new knowledge. The images on the slides often represent only a portion of the spoken content (audio-and-picture information). Pictures can enhance memory retention for information presented with both audio and pictures. However, it is unclear how well students recall material that is presented solely through speech (audio-only information) when it is spoken alongside audio-and-picture information. Images can support learning when paired with matching audio; however, they also have a perceptual advantage over words, therefore, they may also distract attention from audio-only information. Especially when the number of simultaneous images increases. Therefore, this study tested whether learning efficiency for audio-only information changes with varying numbers of pictures compared to audio-and-picture information. We recruited 260 high school students ($M = 16$ years, $SD = 0.874$), and each student watched a 12-slide multimedia presentation. The number of content-relevant pictures per slide varied from 0 to 2. Afterward, participants answered 24 questions assessing recall of audio-and-picture and audio-only information. Results showed that students generally recalled more audio-and-picture information. The recall of audio-only information was similar for slides including zero or one picture. However, recall significantly decreased when two pictures were simultaneously presented. These findings suggest that images can effectively emphasize and teach important terms and concepts. However, to achieve the best results, it is advisable to include no more than one picture per slide. Including even two images may decrease the learning efficiency of the audio-only information.

Keywords: Cognitive load, Digital presentations, Information processing, Multimedia learning, Learning

Out of Sight, into Hand Gestures: The Interaction between Working Memory Load and Speakers' Cognitive Capacities

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Hand gestures are abundantly used during communication. Beyond their communicative functions, gestures also serve speaker-oriented cognitive functions. Gestures, as embodied representational tools, enable people to externalize internal cognitive operations into a physical space where they can be manipulated or indexed. Using hand gestures supports working memory by helping speakers maintain and manipulate visuospatial information. Given this, the present study aims to investigate the role of hand gestures in working memory processes during language production in a spatial (i.e., navigational) context. Specifically, we will examine whether and how (1) speakers employ hand gestures to manage their internal cognitive load across varying working memory load conditions (i.e., when the to-be-told stimulus is present vs. absent), and (2) speakers' own cognitive resources (i.e., verbal and visual-spatial working memory capacity) interact with this process. This research is ongoing, with data collection still in progress. We will present preliminary findings at the conference. We will collect data from 55 native Turkish speakers, aged between 18 and 35. Participants will explain some routes depicted on different maps under two different conditions: when the map is absent during route description (describing from memory) vs. when the map is present in front of them during route description. We will examine speakers' iconic gesture use. Furthermore, participants' verbal and visuospatial WM capacities will be measured through digit span and Corsi block-tapping task, respectively, to examine how speakers' cognitive constraints interact with the task demands. The present study aims to contribute to theories of embodied cognition and multimodal language production.

Keywords: multimodal language production, gestures, embodied cognition

Effects of Gender-Fair Language on Motivation in Mathematical Tasks

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Stereotypes regarding women in math and science are well-known predictors of participation, attitudes, performance, and career choices. Gender-fair language can mitigate negative effects of these stereotypes. Vervecken & Hannover (2015) showed that using both feminine and masculine forms in occupational descriptions reduced feelings of alienation and increased self-efficacy among women compared to generic masculine forms. Similarly, Kricheli-Katz & Regev (2021) found that addressing participants in generic masculine forms during math tasks led to poorer performance among women, while men were unaffected. However, the effects of non-binary gender-fair language in German, such as gender-star forms (Teilnehmer*innen) or neutral forms (Teilnehmende), remain unexplored. We propose an online experiment to minimize stereotype threat and role-model interference. Participants (4 groups, equal in gender) will complete a standardized multiple-choice math test inspired by the German Kangaroo competition. Each group will be addressed using one of four language forms: gender-star, neutral, feminine, or masculine form. We will measure correct answers and time spent per question as indicators of performance and effort. After the test, participants will self-assess their performance, report attitudes toward mathematics and name their field of study, age, and gender identity. We expect gender-fair forms to positively influence time investment and self-assessment among female participants. Future studies should examine interactions between language and role-model effects, for example, in classroom settings with teachers varying in gender presentation.

Literature:

Vervecken, D., & Hannover, B. (2015). <https://doi.org/10.1027/1864-9335/a000229>

Kricheli-Katz, T., & Regev, T. (2021). <https://doi.org/10.1038/s41539-021-00087-7>

Keywords: psycholinguistics, gender-fair language, stereotype threat, self-efficacy, motivation

Language-Driven Spatial Memory: Evidence from Distributional Semantics

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Research suggests that memory performance depends on spatial distances, either between memorized objects and salient landmarks or between the participant and the object, indicating that people flexibly rely on available spatial cues (Nett et al., 2025). Another line of research demonstrates that people utilize distributional semantic knowledge about space, as captured by Distributional Semantic Models, when evaluating distances between cities (Gatti et al., 2024) or spatial relations between objects (Louwerse & Jeuniaux, 2010). Recent evidence also suggests that spatial information derived from words lacking explicit spatial meaning can influence motor behavior and spatial intuitions (Tsaregorodtseva, Rinaldi, & Marelli, 2025). The present study combines these lines of research to test whether participants use language-derived spatial information when retrieving object locations from memory. The stimuli are objects with linguistic labels that are not overtly spatial but exhibit distributional associations toward spatial words (e.g., hammer and its association with Ahead–Behind, Close–Far, North–South, East–West). We employ the Garden Game (Nett et al., 2025), a laptop-based virtual-reality task for investigating spatial memory. In each trial, participants navigate a virtual garden, memorize two labeled objects, and later indicate their positions on either an allocentric or egocentric map. We predict higher memory performance (response times and accuracy) when linguistic information aligns with spatial cues in the environment – when a word linguistically associated with North or Ahead corresponds to the object’s position in the environment in allocentric or egocentric perspective, respectively. This would demonstrate that language-derived spatial information contributes to spatial memory retrieval.

Keywords: distributional semantics, spatial memory, virtual reality

Lexical selection, word production and the other way round: Novel word processing in a reference game context

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Successful communication depends upon many cognitive processes. Speakers must create a signal that they think is the best for their recipients to infer the intended meaning. To achieve this, humans rely on words from their lexicon as a versatile tool for conveying meaning. However, the correspondence between the form of a word and its semantics is not entirely arbitrary, with some regularities in the mapping between word forms and corresponding meanings in natural languages. This systematicity can be extended beyond the boundaries of existing languages and applies even to non-existing letter strings, which lack conventional meaning (pseudowords). Using distributional semantic models, we can produce quantitative representations for these novel words and investigate the extent to which people rely on their sub-lexical patterns to assess meaning. The present study builds on this logic: by presenting participants with novel, supposedly meaningless items in a reference game, we can tease apart how orthographic overlap and semantic similarity influence their intuitions and communicative behaviour. More specifically, we plan to recruit pairs of participants in which a “speaker” will have to select two pseudowords (“targets”) from a grid that, according to their intuition, go well together and generate an existing “clue” word that will allow a “recipient” to select the intended targets from a context of distractors.

We expect that both novel word processing and the production of existing words can be jointly modelled within a computational framework of word selection. The current study design will be presented (data yet to be collected).

Keywords: pseudowords; communication; semantic processing; lexical retrieval; reference game

Perceiving absence: P3 signatures of surprise from occluded space

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When navigating our world, we often feel that we see the whole scene around us. However, large parts of nearby space are often not visible because they are occluded by other objects. Behavioural evidence suggests that such occluded regions can be perceived as empty, which is known as the illusion of absence. Stage magicians use this illusion to make objects appear out of thin air. If an object emerges from seemingly empty space, its appearance should be surprising. We tested this prediction with EEG by revealing objects from behind an occluder while measuring the P3 component of event-related potentials, which is an established index of surprise. The occluder was a homogeneously grey field with holes that exposed the background. We manipulated occluder size by decreasing the size of the holes. Based on previous findings showing that the illusion of absence is more pronounced for smaller occluders, we expect that revealing an object from behind a small occluder will elicit a larger P3 amplitude than revealing it from behind a larger occluder. We will present results of this ongoing study. The findings of this study are relevant not only to the basic perceptual research of occluded space, but also to practical applications in road traffic safety, as well as stage magic, where objects seem to appear from empty spaces. This study was supported by the Research Council of Norway, project number 334817.

Keywords: illusion of absence, EEG, visual perception, traffic safety, stage magic

Modern datasets to constrain parameters of early spatial vision models: improved methodology and increased statistical power

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Early vision models attempt to capture how visual information is encoded and represented in the early stages of the visual system. As with most models, the improvement of early vision models depends on suitable, high-quality experimental data to constrain their parameters. Campbell and Robson's (1968) foundational work, introducing the notion of independent spatial frequency channels in early vision, is one of the most influential studies in this field. Despite its significance, their study has methodological limitations, however, namely the experiment design using the method of adjustment and a very limited number of participants consisting of the two authors only. These limitations make the original data unsuitable for constraining current computational early vision models.

Here we replicate and extend Campbell and Robson by employing a two-interval forced-choice (2IFC) design with a sufficient number of participants and trials to ensure statistical power. Pilot data reproduce the contrast sensitivity function (CSF) as well as the expected contrast sensitivity ratio of $4/\pi$ for square-over-sine sensitivity. Additionally, we also replicate the seminal study by Graham and Nachmias (1971), to directly test the putative phase-independence of the multiple-channels hypothesis. Given that similar methodological limitations exist in the latter study, the experimental design again will be 2IFC with the method of constant stimuli with adequate participant numbers and trials. Together, our experiments provide a modern, much extended replication of two seminal studies in pattern perception, allowing the results to be used to constrain the parameters of early vision models.

Keywords: Early vision models, Contrast sensitivity function, Spatial frequency channels, Multiple-channels hypothesis

State and Social Attraction - Scents Modulate Affect and the Cheerleader Effect

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The cheerleader effect arises when subjects rate the attractiveness of faces in groups vs. isolation. The same face stimulus is judged to be slightly more attractive in a group as compared to the isolated display. Several studies have attempted to explain the effect through processing mechanisms of the visual system, such as comparisons, hierarchical encoding, and more. However, empirical results have repeatedly revealed inconsistencies with these explanatory approaches. Previously, we observed initial evidence of the cheerleader effect being modulated by subjects rather than stimuli. Therefore, we reasoned that manipulating the mood should influence the extent of the cheerleader effect. In Experiment 1, we first successfully managed to influence subjects' affect through pleasant and unpleasant odors as revealed by PANAS scores under continuous olfactory stimulation via individually benchmarked most-preferred vs. least-preferred fragrances. In Experiment 2, each subject's cheerleader score was assessed under the two respective odor conditions. As a result, the cheerleader effect appeared under the most-preferred fragrance condition but disappeared under the least-preferred fragrance condition. To the best of our knowledge, this is the first demonstration of intraindividual state differences impacting the cheerleader effect. We speculate that this approach represents a promising avenue for future understanding of this elusive psychophysical phenomenon.

Keywords: Cheerleader Effect, State, Facial Perception, Olfaction, Attractiveness, Vision, Multimodal Perception

Accumulated Evidence as an Additive Performance Measure Based on Confidence Ratings

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Perceptual decisions are often modeled as successively accumulating evidence. The theoretical basis for this are sequential probability ratio tests, which propose that the total evidence is the sum of multiple individual pieces of evidence collected throughout the perceptual process. In contrast to this notion, existing performance measures for perceptual decisions, such as accuracy and sensitivity d' , are not additive. Here, we suggest computing a performance measure based on participants' decisions and confidence ratings that we dub accumulated evidence E . This measure quantifies evidence additively: Evidence accumulated during a first stimulus presentation interval, $E[0, a]$, adds up with that during a second interval, $E[a, b]$, to the total evidence accumulated during the whole presentation $E[0, a] + E[a, b] = E[0, b]$. This additivity allows measuring the otherwise not directly accessible evidence that is exclusively accumulated during the second presentation interval, $E[a, b] = E[0, b] - E[0, a]$. In a first experiment, we provide direct support for previous findings suggesting a deceleration in evidence accumulation ($E[0, a] > E[a, b]$). In a second experiment, we quantify how much evidence accumulation in later stages ($E[a, b]$) depends on that of earlier stages ($E[0, a]$). Limitations arise from the reliance on confidence ratings, which are biased by various factors so that careful interpretations are needed. Overall, this approach allows formulating more precise hypotheses about evidence accumulation during perception.

Keywords: evidence accumulation, sequential probability ratio test, confidence ratings

Metacognitive Judgments of Auditory Distraction Across Memory Tasks

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We tested the hypothesis that prospective and retrospective metacognitive judgments of performance in memory tasks accompanied by auditory distraction reflect general beliefs about the harmfulness of noise rather than task-specific distraction effects. Previous studies have shown that people can correctly rank different types of sounds from steady to changing as more or less disruptive, but it remains unclear whether these assessments adapt to the nature of the memory task. In a series of experiments, participants performed a missing-item task, which is thought to be immune to some of the distraction effects, and a probe serial-recall task, which is more sensitive to the distraction effects. In the probe serial-recall task, we also manipulated task difficulty by varying the memory set size, allowing us to test whether metacognitive judgments of distraction are modulated by cognitive load. Before and after task, participants predicted and postdicted the extent to which different types of background sounds impair their performance. The results suggest that people's judgments of distraction depend on whether the sound is changing or steady, that these patterns are largely the same regardless of the type of the memory task, and that some metacognitive patterns are modulated by cognitive load. We suggest that metacognitive monitoring of distraction is sensitive to both the characteristics of the sound and the memory task it accompanies, but not to the interactive patterns of the two.

Keywords: auditory distraction, metacognitive monitoring, metacognitive judgments, memory performance, probe serial recall task, missing-item task, changing-state effect

Evaluating the Mind's Body: Metacognition of Motor Imagery

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Humans can monitor their movements, an ability helpful to detect errors and improve future motor learning. To quantify this motor metacognitive ability, experimenters typically ask participants to make, and then introspect on, a voluntary movement. But voluntary movements include several processes like motor intentions, planning, and efferent commands; as well as afferent sensory and proprioceptive consequences. As a result, it is unclear whether motor metacognitive ability results from participants monitoring efferent or afferent processes (or both). To answer this question, we focussed on imagined movements, that have been shown to be functionally and computationally equivalent to executed movements. This allowed us to investigate efferent information, isolated from the associated proprioceptive and sensory feedback. Participants first imagined one of two movements, rated the vividness of the motor imagery, and subsequently executed a movement. We collected movement data and vividness ratings in two conditions that differed in whether the executed movement matched (congruent) or differed (incongruent) from the imagined movement. We reasoned that, if participants have metacognitive access to efferent information, the expected congruency effect (faster reaction and movement times on congruent than incongruent trials) would scale with reported vividness. We report the results of two experiments ($n = 30$; $n = 45$) that differed in the movements imagined and performed, where we indeed found the expected interaction effect, suggesting that young, healthy adults have weak access to efferent motor commands alone, independently from afferent information.

Keywords: metacognition, motor imagery, introspection

The Impact of External Cues on Confidence and Accuracy in Source Memory

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Confidence in memory decisions usually mirrors the accuracy of those decisions, but there are exceptions. One exception is believed to occur when external cues - such as information from other people - are introduced during source memory tasks. While these external cues do influence accuracy depending on their validity, confidence judgements (CJs) remain unchanged. In a series of experiments, we set out to verify the robustness of the confidence-accuracy dissociation pattern in source memory tasks. First, we replicated the dissociation with a source task in which participants studied individually presented words (items) together with orienting questions (sources). We then manipulated source strength by varying the number of presentations of study items (three versus one) and assigning separate sources to strong versus weak items. Finally, we eliminated the confound by which item and source strength were correlated by keeping the number of item presentations constant while manipulating the number of presentations of each item with an orienting question (three out of three presentations versus one out of three). Together, we have shown that although the confidence-accuracy dissociation generally holds in source memory tasks, it is not universally found, and we present boundary conditions for its appearance.

Keywords: metamemory, confidence-accuracy dissociation, external cues, source memory

What might happen in the future? Event valence and event probability in personal and collective future thinking

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When thinking about their personal future, people in Western countries tend to have a positivity bias, such that they typically generate more positive than negative events. In contrast, when thinking about the future of their country, they usually show a negativity bias, with more negative than positive events being generated. The goal of the present study was to replicate these patterns in a German sample ($N = 113$) and to additionally explore the role of likelihood of occurrence for events generated for the future. A fluency task with different prompts was used, asking participants to generate personal and collective events for both the past and the future. Participants then rated each event's valence and, in the case of future events, also judged the probability for the event to actually happen in the future. As expected, participants showed a positivity bias in the personal domain and a negativity bias in the collective domain, irrespective of whether they were asked about the past or the future. Participants considered their generated future events to be fairly likely, with average probability estimates of around 67%. Moreover, a significant interaction between domain and valence was observed: In the personal domain, positive events were considered as more likely than negative ones, while in the collective domain, negative events were considered as slightly more likely than positive ones. These results confirm findings from prior studies conducted in other Western countries and introduce probability estimates as a potential point of interest for collective future thinking research.

Keywords: future thinking, collective memory, autobiographical memory, positivity bias, negativity bias

When Stories Shift: Event Boundaries Effects on Episodic Memory Formation

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The present study investigated how encountering event boundaries in narratives modulates memory formation. Participants listened to five-sentence stories in which a critical word in the third sentence either continued the ongoing event (no-boundary) or marked a transition to a new event (boundary), followed by two sentences confirming the action. Memory for these critical words was later assessed with a recognition memory task, followed by an associative memory test. In this test, correctly recognized critical words were presented as probes, and participants judged which of two words had appeared in the same story as the probe word. Two associative pairs were examined: preceding pairs (critical word paired with a word from the second sentence) and following pairs (critical word paired with a word from the fifth sentence).

Critical words marking an event boundary were remembered better than no-boundary words. While associative memory for preceding pairs did not differ between conditions, memory for following pairs was enhanced in the no-boundary condition, reflecting the benefit of maintained contextual stability. An analysis restricted to boundary words with correct high-confidence responses revealed enhanced associative memory for preceding than for following pairs. Taken together, these findings suggest that contextual stability supports memory integration for following pairs. In contrast, boundaries enhance memory for the boundary itself, likely by directing attention to changes in the story. This attentional shift appears to strengthen associations with preceding information, as indicated by high-confidence responses, possibly through reinstatement processes that solidify the memory trace of the preceding event with the new event.

Keywords: Event Segmentation, Event Boundary, Naturalistic Narratives, Item Memory, Associative Memory

Blame vs. Frame: How Constructive Words Protect Attentional Focus

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Research on so-called ‘nonviolent communication’ (NVC) has so far focused on evaluating training programmes, providing evidence of improved emotional regulation and interpersonal skills in participants following training compared with pre-training. Yet little is known about the immediate emotional and cognitive effects of communication style on recipients in real time.

To address this gap, two experimental groups were exposed to five realistic, fictional scenarios comprising a few sentences and differing in style between groups: an accusatory ‘blame’ style versus a constructive ‘frame’ style (based on NVC principles). After each scenario, participants completed a colour-word Stroop task to assess attentional control. Affect was measured pre- and post-experimentally using the Positive and Negative Affect Schedule (PANAS). Results indicate divergent affective and attentional trajectories. Participants in the blame group reported more negative affect afterwards, whereas those in the frame group showed increased positive affect. In the Stroop task, the frame group demonstrated a training-related effect across blocks, suggesting improved attentional control, while the blame group showed no such improvement.

These findings indicate that communication style directly affects both affective state and attentional performance in recipients, suggesting that constructive framing supports attentional efficiency and positive affect, whereas accusatory communication hinders attentional adaptation and increases negative affect. Taken together, these results show that even brief exposure to a particular communication style is sufficient to modulate recipients’ cognitive and emotional responses, providing insight into the mechanisms by which interaction dynamics shape attention and emotional regulation in real-life situations.

Keywords: interpersonal communication, attentional control, affective responses, communication style

The impact of facial dominance and trustworthiness on gaze-driven attention

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Humans reliably orient visual attention towards social signals such as direct gaze, especially when it is established suddenly (i.e. involves motion). Dynamic facial variables, such as emotion expressions, further modulate attention capture by direct gaze. However, it remains unclear whether stable facial traits influence gaze processing. In two experiments, we examined the impact of two stable facial dimensions – dominance and trustworthiness – on gaze-driven attention. Participants viewed grids containing four versions of the same facial stimulus. Gaze direction (direct, averted) and motion (present, absent) were varied independently: two faces changed gaze direction (sudden-direct and sudden-averted), while two maintained gaze direction (static-direct and static-averted). Stimulus gender and facial trait (high vs. low dominance in Experiment 1; high vs. low trustworthiness in Experiment 2) varied between subjects. Participants identified a target letter appearing on one stimulus per trial via key-press. Reaction times (RTs) for correct responses served as dependent measure.

Replicating established findings, direct (vs. averted) gaze and present (vs. absent) motion both significantly reduced RTs. Additionally, we found generally slower responses to female (vs. male) faces. Facial dominance did not interact with gaze or motion effects. A three-way interaction revealed that low-trustworthiness, gaze-averting female faces elicited notably slower responses than the other conditions. Overall, our results suggest that, unlike transient facial states, stable facial traits do not modulate low-level attentional responses to gaze cues. However, face gender might impact attentional orienting speed, both independently and in conjunction with facial trustworthiness.

Keywords: gaze perception, social attention, facial traits, social cognition

A hybrid Stop-Signal – Concealed Information Test: How increased response inhibition demands affect guilty–innocent classification accuracy.

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The Response Time-based Concealed Information Test (RT-CIT) detects recognition of concealed information by comparing RT's of probes (crime-related items) and irrelevant stimuli, in an oddball task. For "guilty" participants, slower responses to probes than to irrelevant items reflect the well-established RT-CIT effect. Since deception is thought to require greater cognitive effort than truth-telling, researches have investigated how adding cognitive load affects this difference. However, meta-analytic evidence by Verschuere et al. (2018) indicated mixed results: while additional cognitive load can help elucidate the cognitive mechanisms underlying deception, it may also impair truth-telling and thereby reduce the diagnostic separation between lying and truth-telling. In our novel hybrid task, we integrate the RT-CIT with a Stop-Signal Task (SST) to examine (1) how cognitive load in the form of response inhibition affects the RT-CIT effect, (2) whether individual RT-CIT effects combined with SST-based inhibitory control measures improve classification accuracy, and (3) whether individual differences in SST performance predict the RT-CIT effect at the individual level. Participants are randomly assigned to either a guilty condition, committing a mock cybercrime, or an innocent condition, performing a neutral task. Cognitive load will be manipulated within-subjects, with each participant completing the standard RT-CIT and a hybrid SST + RT-CIT, with 25% of each RT-CIT item type paired with a stop signal. We expect the standard RT-CIT effect to remain robust and hypothesize that adding SST-based inhibitory control demands will improve classification of guilty versus innocent individuals, yielding a more sensitive measure of the cognitive processes underlying information concealment.

Keywords: Stop-Signal Paradigm, Reaction Times, Cognitive load, Concealed Information Test (CIT), Deception, Response Inhibition

Asymmetry in Post Error Adjustments

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People adjust their behavior after committing an error. They respond more slowly (Danielmeier & Ullsperger, 2011), more accurately (Danielmeier & Ullsperger, 2011) and also tend to voluntarily switch to another task (Spitzer et al., 2022) or strategy to solve the same task (Aust et al., 2025). However, switching the strategy after an error seems to depend on the strategy used before. Mental errors elicit a strong tendency to switch to an offloading strategy, while errors using the offloading strategy do not elicit the same tendency to switch back. We therefore conducted 3 experiments to explore this phenomenon, manipulating error source attribution (externally vs. internally caused), error probability and measuring affective response. Our results indicate, that neither error probability nor error source attribution can explain the asymmetry found in post error strategy switches. However, the affect elicited by the two strategies and error conditions does vary in accordance with the switch tendency.

Keywords: Post-Error Adjustments, Strategy Selection, Cognitive Offloading, Affective Priming

What goes around comes around? Sequential biases in non-categorical action decisions

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Task-irrelevant contextual cues (distractors) are known to influence action control: repeating a distractor typically speeds and improves performance when the response repeats, but impairs performance when the response changes. Vice-versa, distractor changes facilitate response changes, but impair response repetitions. These effects are commonly attributed to automatic retrieval of prior action episodes. However, prior research in this area generally employed tasks with a small number of discrete response options, limiting insight into the specific biases and dynamics of sequential action planning. In this study, we examine how distractor repetitions and changes shape continuous response execution. Participants judge the font color of a word by selecting a position on a continuous color wheel (0–359°). Across trials, both the task-irrelevant word identity (the distractor) and the font color can repeat or change. This design allows us to assess not only reaction times and accuracy but also directional biases in response trajectories and the similarity between consecutive responses. We expect repeating contextual cues to bias responses toward the previous response location (retrieval-driven attraction), whereas contextual changes should bias responses away from the previous location (shielding of prior representations). Moreover, repetition benefits should follow a center-surround inhibition profile, with strong distractor repetition benefits near the previous response location, a gradual shift toward distractor change benefits at intermediate angular distances, and minimal distractor-related biases at large distances. These findings will clarify how episodic retrieval processes shape the fine-grained dynamics of ongoing action control.

Keywords: Action Control, Ideomotor, Feature-Response Binding, Center-Surround Inhibition

Task-relevance in response priming: flip-flopping visual dimensions

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This study investigates how task-relevance modulates priming effects across two different visual dimensions, which are colour and shape. Participants were shown with sequentially presented coloured shapes (red/green circle/square). In the first two sessions, participants were required to react to the colour of the target while ignoring the shape; in the subsequent two sessions, participants were required to react to the shape while ignoring the colour. With the switching of relevant dimensions in the target, we examine their effect on priming. Additionally, we compared the effect of congruence between the task-relevant and task-irrelevant features. The data show clear priming effects in both tasks, color and shape. Surprisingly, only the color of the prime influenced responses on the color task, while only the shape of the prime influenced responses on the shape task. In contrast, the respective response-irrelevant feature seems to be blocked from response activation. We refer to this effect as “feature flop”, because the action triggers behave like a simple electronic flip-flop gate. Our results highlight the importance of task sets (“action trigger conditions”) for the information flow between specific stimulus features and motor responses.

Keywords: task-relevance, priming, flip-flop, action trigger

Explicit Sense of Agency Ratings Capture Distinct Constructs

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Perceived control is a core component of the sense of agency, yet it remains unclear what people actually judge when explicitly rating their agency. Previous studies have assessed subjective ratings of “control over,” “responsibility for,” or “predictability of” an outcome, often treating these concepts as interchangeable measures of agency. However, it is uncertain whether such ratings reflect a single underlying construct.

To clarify this, we developed a novel paradigm that systematically manipulated control and predictability. Participants chose between two pie charts (free-choice) or were assigned one (forced-choice). Each chart contained colored fields of varying sizes, with each color representing a possible outcome and field size indicating its probability. Participants were instructed that one field would be selected randomly and that their goal was to maximize the chance of obtaining a specific color. Control and predictability were manipulated through variations in choice options (free vs. forced choice), number of possible outcomes (colored fields), and outcome probabilities (field sizes). After each selection, participants rated their perceived control, predictability, and responsibility.

Linear mixed-model analyses revealed that these ratings were only moderately correlated, indicating partially distinct underlying constructs and substantial interindividual variability. Responsibility ratings showed the greatest variability and were least explained by objective task parameters. These findings suggest that explicit control ratings capture heterogeneous facets of agency, underscoring the need for clearer conceptual and methodological differentiation.

Keywords: sense of agency, action control, sense of control, explicit ratings

Elicitation bias caused by minority/majority focus in norming studies of gender ratios of activities with unipolar scales

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Norming studies of gender ratios (e.g., Misersky et al. 2014) are frequently used for stimuli selection in psycholinguistic studies (Kim et al. 2024). We examine the stability of stereotype ratings of activities in German (e.g., Zug fahren 'take the train') with two unipolar binary gender scales (Sato et al. 2025) to test their interdependence. 306 German speakers estimated the proportion of women (version 1) or men (version 2) engaging in each of 96 activities on a 0-100% scale (between-subject). Version 2 was recoded (100–estimate) to quantify measurement inconsistency for each activity using a paired Z-test between the mean proportions of women of the two versions. Crucially, even though estimates were highly correlated ($r = 0.92$), only 29 activities showed no significant differences between the two versions ($|Z| \leq 1.96$), confirming psychometric stability for merely ~30% of the items ($N = 0.99$). For highly stereotyped activities (e.g., female: Harfe spielen 'play the harp'/male: Pfeife rauchen 'smoke a pipe'), the ratings demonstrate a clear elicitation bias caused by gender group salience: Minority-focused questions enhanced the stereotype, while majority-focused questions led to stereotype attenuation. While the latter might be due to social desirability, the former could reflect a socially motivated confirmation bias, where participants maximize the estimated underrepresentation of the minority group to conform with perceived inequality. For neutral activities, the recoded female proportion was significantly lower than the direct proportion. This study not only provides a stable subset of norms, but also a robust methodological framework for assessing stereotype stability.

Keywords: norming studies, gender stereotypes, measurement inconsistency, elicitation bias, context-dependence, social psychology

Effects of Reward, Affiliative, and Dominance Smiles on Fairness-Related Decision Making in the Ultimatum Game

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Facial expressions serve as social cues that shape decision processes in social interactions. This study investigated how distinct functional smiles shape fairness decisions by combining behavioral, model-based (HDDM), and ERP analyses. Thirty participants acted as responders in an ultimatum game where proposers displayed enjoyment, affiliative, or dominance smiles preceding fair or unfair offers. Behaviorally, a significant emotion $\times$ offer interaction emerged: participants rejected unfair offers far more often than fair ones, demonstrating a robust fairness preference. Under unfair conditions, however, enjoyment smiles significantly reduced rejection compared with all other emotions, indicating that positive expressions mitigated participants' aversive reactions to inequity. Model-based analyses (HDDM) of the unfair condition revealed drift rates (v) closest to zero for enjoyment smiles, reflecting slower evidence accumulation when cooperative intent conflicted with inequitable treatment. At the neural level, early N400 amplitudes showed main effects of offer type and emotion, being smallest for fair offers and enjoyment smiles—conditions most consistent with expectations of fairness and cooperation. The CPP captured the integration of emotional and fairness information, showing an emotion $\times$ offer interaction driven by unfair offers; under these conditions, enjoyment smiles elicited larger late amplitudes before response, indicating that when evidence accumulation is slower, CPP activity intensifies during the final decision stage. Together, these findings suggest that positive emotional cues recalibrate fairness decisions by modulating the temporal dynamics of evidence integration, illustrating how positive signals from the proposer can temper—but not overturn—people's aversion to unfairness.

Keywords: facial expressions, smiles, decision-making, Ultimatum Game, event-related potentials (ERP), drift diffusion modeling

A Mental Scaling Perspective on Advice Taking: The Impact of Ecological Frequency

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We propose an integrative theoretical framework of the cognitive-ecological processes of impression updating. The framework combines Bayesian belief updating with the classical conceptualisation of mental scaling – the idea that cognitive representations of ecologically scaled values are systematically disproportional. A straightforward way to approximate the mapping of ecological scales (e.g., prices in €) on mental scales is to use ecologically determined relative ranks (e.g., Stewart et al, 2006). Four advice-taking (“judge-advisor-system”) experiments ($N = 672$) replicated and consolidated effects of advice convergence and distance, as well as the amount of advice, while all advice properties were manipulated based on ecological frequency. We thereby replicated existent findings on advice properties while constantly and experimentally controlling for ecological frequency. In a second step, we consider that ecological frequencies are typically strongly skewed (mostly lower numbers are dense and frequent, while higher numbers are typically distinct and rare). We show that such ecological asymmetries impact how confidence ratings are made, as well as changes in estimate and confidence – even when we statistically control for distance on the ecological scale. Along these findings, we demonstrate that the inclusion of mental scaling serves well in generating novel predictions and overcoming overly narrow and often times implicit boundaries and auxiliary assumptions of (normative) models applied to impression updating tasks.

Keywords: impression updating, estimation, judgment, advice taking, mental scaling, ecological analysis

Loss Aversion in Choices versus Valuations from Experience

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Loss aversion was long regarded as one of the most robust phenomena in the social sciences (Kahneman, 2011). Recent research questions the generalizability of loss aversion (e.g., Gal & Rucker, 2018). While loss aversion has mostly been tested in binary choice or accept/reject tasks, it appears less pronounced in decisions from experience (Ert & Erev, 2008; Yechiam & Hochman, 2013). In two experiments, we tested whether loss aversion generalizes to decision-from-experience paradigms in which participants sampled discretized draws from underlying continuous distributions. In the first experiment, we used subjective valuation tasks in which participants evaluated individual mixed lotteries containing gains and losses. In the second experiment, we used a binary choice paradigm in which participants sampled draws from two lotteries before choosing one of them to play. Lotteries were paired to have matched expected values but different outcome ranges, producing positive-positive, mixed-positive, and mixed-mixed combinations. We did not observe higher weights for losses than for gains in the valuation-from-experience task. In contrast, in choices from experience, participants preferentially selected positive-only lotteries and avoided those containing losses. Our findings suggest that loss aversion depends on the elicitation method (experienced-based choice versus valuation) adding to the literature documenting differences in decision behavior depending on the elicitation method (Bouchouicha et al., 2024; Lichtenstein & Slovic, 1971).

Keywords: decision-making, decision-from-experience, sampling, loss aversion, choices, valuations

Searching through sequences of facial expressions using the Multi-Item Localisation (MILO) task

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The Multi-Item Localisation (MILO) task provides a powerful framework for examining prospective planning and inhibitory tagging through sequential, goal-directed search behaviours (Thornton & Horowitz, 2004). Typical MILO studies use overlearned symbolic stimuli such as numbers or letters. The current work adapted the MILO task to present emotional facial expression sequences, to test how expressive faces influence search organisation, planning efficiency, and inhibitory control. Across three online experiments (total $N = 144$), participants searched through graded emotional sequences comprising positive–neutral–negative or negative–neutral–positive expressions using real faces with real expressions (Experiment 1), real faces with morphed expressions (Experiment 2), or synthetic MetaHuman faces with morphed expressions (Experiment 3). Serial Reaction Time (SRT) patterns for Vanish and Remain trials always followed parallel trajectories, replicating previous work and indicating that inhibitory tagging is independent of stimulus complexity. Participants showed a clear switch cost at the neutral face, suggesting that emotional sequences were segmented into two categories rather than being processed as a continuous gradient. Synthetic faces yielded smoother SRT trajectories, faster completion times, and higher search fluency than real faces. These findings show that MILO principles extend robustly to expressive faces and highlight synthetic faces as a valuable tool for reaction-time paradigms requiring precise perceptual control. The adapted MILO paradigm offers a novel behavioural method for probing emotional processing, perceptual fluency, and sequential organisation in complex visual domains.

Keywords: Visual search, facial emotion, synthetic faces

Perception of biological sex of faces in fovea and periphery

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A human face instantly captures attention over other stimuli. Despite this perceptual priority, face perception is prone to bias. Faces tend to be perceived as more male under uncertainty (e.g. Watson et al., 2016). Here we investigated face perception under uncertainty in the foveal and peripheral visual field and the effect of presaccadic attention. In our first experiment, participants fixated a central cross and discriminated biological sex of either centrally or peripherally presented face stimuli morphed between female and male face images. To manipulate perceptual uncertainty within the foveal condition, faces were masked after 65 ms or 110 ms. Obtaining psychometric functions, we expected a growing male bias (PSE shift) with increased uncertainty (increased JND). We found the expected differences in uncertainty but a male bias in the peripheral condition only. Within the peripheral condition, male biases increased with increasing JNDs. In our second experiment, we aimed to reduce uncertainty and male biases in the periphery by a presaccadic attention shift. Participants either executed a saccade towards a peripheral face or held fixation. Upon saccade detection, the face was masked, and resulting presentation durations were replayed in the fixation condition. Contrary to the expected presaccadic enhancement, JNDs did not differ between conditions and a male bias was found for both conditions. We reason that pre-saccadic attention might not have overcome the visual mask that remained visible about 200 ms after the saccade. We conclude that peripheral face perception is male biased and that presaccadic attention cannot “unmask” a postsaccadic mask.

Keywords: periphery, presaccadic attention, face perception, male bias

Does neural processing of emotional faces require attention?

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Prioritized processing of fearful compared to neutral faces is reflected in differential hemodynamic responses and event-related potentials (ERPs). A famous fMRI study by Pessoa and colleagues (2002) reported an abolition of emotional differentiation under distraction tasks. However, there is an ongoing debate over the extent to which emotional faces can be processed without attention or under competing high-load conditions, as early ERPs, such as the N170, are reliably modulated by fearful facial expressions under high perceptual load and even in studies using efficient masking methods. Here, we replicated the set-up from Pessoa and colleagues (2002) in a combined EEG/fMRI study with a large sample ($N = 51$). In three tasks, participants paid attention to the gender of the face and performed either an easy color discrimination task or a difficult orientation discrimination task, while fearful and neutral facial expressions were presented. Fearful faces elicited increased N170 responses during all three tasks, accompanied by increased BOLD responses in the face network (fusiform gyrus, superior temporal sulcus), while amygdala responses did not differentiate between fearful and neutral faces. ERP and fMRI measures did not interact with the attention task. These findings reveal that the early stages of fearful face processing appear to be invariant to manipulations of load and/or competing attention tasks.

Keywords: ERP, attention, emotion

Creativity in Crisis: Investigating War-related Stress and Creative Thinking

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Does stress, particularly life-threatening stress have an impact on people's ability to think creatively? And how does it affect fluency, flexibility and originality of ideas? Previous research has reported mixed findings on the relationship of stress and creative thinking. While some studies showed negative effects of stress on cognitive flexibility, a key component of creative thinking, other empirical findings suggest that challenging and adverse experiences can catalyze ideation and generation of innovative solutions thus strengthening originality of ideas. The study further builds on theoretical models including creativity as an adaptation and survival pathway, proposing that moderate stress may enhance certain aspects of creative performance, while excessive stress may hinder it. In this study, we investigate the effect of war-related stress on creative thinking in young adults. Using an online survey, we investigate three groups - Ukrainians in Ukraine, Ukrainian refugees in Germany, and Germans. To assess creative thinking performance, we use the Doodle Creativity Task and the Alternate Uses Task to investigate fluency, originality, and flexibility of ideas. In addition, we ask for self-reports of stress and post-traumatic symptoms (during the last month), as well as anxiety and depression in order to distinguish different levels. In our analysis, we are using these self-reports as predictors for creative performance. This work aims to clarify how war-related stress influences creative thinking performance, particularly originality, flexibility, and fluency of ideas and with that contributing to the broader understanding of creativity in crisis.

Keywords: Stress, creativity, divergent thinking, fluency, flexibility, originality, war-related stress

Implicit anger regulation in a mental time-travel exercise moderated by action vs. state orientation

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Counter-regulation hypothesis posits that the current affective state drives attention to upcoming emotional stimuli of opposite valence. The presence of such an effect was tested on healthy persons performing a short mental time-travel exercise. After induction of anger by autobiographical recall, participants ($N = 24$) were instructed to either immerse themselves in the event (IP) or to refocus on a positive event from a distanced perspective (PTR). This procedure was repeated in the second part, counterbalancing the order of interventions. We applied a symmetry judgment task with a concurrent but task-irrelevant emotional distractor to investigate whether mental time-traveling modulated attention towards emotional information. Participants were instructed to judge the symmetry of three letters that either formed a symmetric (e.g., XXX) or asymmetric stimulus (e.g., XHH). Each trial presented a task-irrelevant emoji, either happy or angry, above the judgment stimulus. Additionally, we administered the action-control scale at the outset. PTR but not IP reduced state anger ($g = -1.7$ vs. 0.18). Consistent with a planned counter-regulation contrast, angry emojis slowed responding relative to smileys in the PTR condition, whereas a small reversed effect occurred in the IP condition ($t(22)=2.23$, $p = .037$). This distraction pattern was more distinct for action orientated persons ($t(22) = 2.30$, $p = .031$) compared to state-oriented persons ($t(22) = 0.67$, $p = .510$). Results are consistent with a counter-regulation interpretation. Action orientation seems to promote emotion-regulation by guided mental time-traveling. Further studies are needed to replicate the effect of PTR and to investigate whether it is a consequence of the reduced anger or directly stems from the intervention.

Keywords: mental time-travel, counter-regulation, emotion-regulation, action-orientation

Using the Pro- / Antisaccade Paradigm to examine Attentional Biases in Prolonged Grief Disorder

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Prolonged grief disorder (PGD) is a new diagnosis that is characterized by intense and debilitating longing for, and preoccupation with, the deceased for a prolonged period of time following the loss of a loved one. Cognitive models of PGD suggest that the integration of the reality of the loss is impeded by avoidance strategies. By using a pro-/antisaccade task, we will investigate whether a constant loss-focus may serve as a perceptual filter that increases the salience of disorder-relevant stimuli that can have both reward (e.g. pictures of the deceased) and threat characteristics (e.g. death-related pictures). We will compare two groups of bereaved persons (PGD vs. no PGD) and healthy controls (intended $N = 93/31$ per group). In pro- versus antisaccade blocks, participants will be presented with idiosyncratic stimuli (related to death, the deceased, a living attachment figure, and the participants' themselves) and neutral stimuli (randomly intermixed) which serve as pro-/antisaccade targets. To assess attentional biases, we will assess differences in saccade latency and accuracy (pro- vs. antisaccade) across participant groups and stimulus categories. Demonstrating systematic attentional biases will help to identify disorder-specific cognitive mechanisms and derive corresponding, targeted clinical interventions for PGD.

Keywords: prolonged grief disorder, eye-tracking, pro-/antisaccades, attention bias

Investigating Validity Sequence Effects in the Contingent-Capture Protocol

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In cueing studies, valid cues indicate the correct upcoming target location, whereas invalid cues appear away from the target. Response time differences (mostly: faster response times for valid, compared to invalid trials) indicate attention capture by the cue. In the contingent-capture protocol, this validity effect is restricted to cues that match the searched for target. In a relatively recent study, however, it has been found that also previous cue validity exerts an influence on validity effects in the contingent-capture protocol [Goller, F., & Ansorge, U. (2015). There is more to trial history than priming in attentional capture experiments. *Attention, Perception, & Psychophysics*, 77(5), 1574–1584. <https://doi.org/10.3758/s13414-015-0896-3>]: if a cue was valid in a previous trial, subsequent cues lead to a higher validity effect, whereas the opposite was found for cues following invalid trials. In some cases, this was even true for cues that did not match the searched-for target. However, the aforementioned study did not control for additional factors, such as luminance and influences beneficial for trial history effects, such as weaker top-down search sets. The experiments proposed in this registered report aim at deepening our understanding of validity sequence effects within the contingent-capture protocol by way of implementing these control conditions.

Keywords: contingent-capture, validity sequence effects, search modes

Dissecting top-down and bottom-up control of visual attention in adults with ADHD in a visual search task

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Attention Deficit Hyperactivity Disorder (ADHD) is a neurodevelopmental condition affecting 2.5–6.7 % of adults and characterized by difficulties in attention regulation, impulse control, and executive functioning. Theories of visual attention differentiate between top-down (goal-directed) control and bottom-up (stimulus or saliency-driven) processes. While early research emphasized a general attention deficit in ADHD, more recent evidence indicates that bottom-up mechanisms may normalize with age, while top-down control deficits persist into adulthood. In this study, we compare the visual search performance of adults with and without ADHD. For this we adapt a visual-search task from Zhaoping and Guyader where participants search for a uniquely tilted target bar among distractors. Complexity of the target and distractors will be varied to investigate how ADHD-related attentional deficits interact with both low-level feature detection and high-level object recognition. Reaction-time, accuracy, and eye-tracking data will be used to capture visual attention and search strategies.

According to the V1-Saliency-Hypothesis (V1SH) simpler feature search should leverage bottom-up processing while more complex conditions require top-down engagement because the saliency contrast of the target is weaker. Based on previous studies we expect individuals with ADHD to show a higher variability in performance and overall reduced top-down control (increased influence of distractors) as well as heightened sensitivity to bottom-up salience (greater attraction by salient stimuli).

By isolating top-down and bottom-up components of visual attention, we aim to clarify their contribution to attentional dysregulation in ADHD and hopefully explain some of the variability of prior results.

Keywords: Attention Deficit Hyperactivity Disorder (ADHD), Attention, Bottom Up, Top Down, Saliency, Visual Search Task

Central-peripheral differences in top-down control during a reversed anomalous visual search task

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Visual search performance depends on the interplay between bottom-up saliency and top-down attentional control. According to the V1 Saliency Hypothesis (V1SH) and the Central-peripheral Dichotomy (CPD) theory, gaze during search should be guided exogenously by saliency signals generated in the primary visual cortex (V1), especially in the peripheral visual field, and by goal-directed recognition in the central visual field. Liang et al. (2023) provided eye-movement evidence for these theories using disk-pairs stimuli, where the target is a homo-pair of same-colored dots (black or white) while non-targets are uniformly oriented hetero-pairs of dots. Due to V1 neural properties, a homo-pair evokes a higher V1 response than a hetero-pair, and intracortical interactions reduce mutual suppression when the two pairs are parallel (Zhaoping, 2020). Indeed, Liang et al. observed a parallel advantage: when the target was parallel to distractors, gaze reached it faster, particularly for targets in the peripheral visual field. Furthermore, they observed a looking-without-seeing phenomenon: gaze was captured by highly peripheral targets even when they were unrecognizable due to visual crowding.

The present study inverts this configuration: the target is a hetero-pair among homo-pair distractors. This inversion is expected to reduce target's bottom-up saliency, increasing reliance on top-down guidance of gaze and attention. Accordingly, V1SH and CPD theory predict the following: in the central visual field there is an enhanced perpendicular advantage, in the peripheral visual field, parallel advantage and looking-without-seeing should be weakened or absent. We plan to report our findings after recording and analyzing our eye-tracking and search-performance data.

Keywords: eye movement, primary visual cortex, saliency, V1 Saliency Hypothesis (V1SH), visual search

Task-dependent modulation of anticipatory motor representations: Evidence from object- and grasp-based priming

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The end-state comfort (ESC) effect reflects the tendency to adopt an initially awkward grasp to achieve a comfortable final posture, indicating anticipatory planning in manual actions. Previous research (Kämpfer et al., 2024) suggests that such anticipatory relationships between initial and final action states are stored in memory and can be measured using a priming paradigm. The present study aimed to investigate whether this anticipatory activation during action perception relies primarily on object-related or grasp-related representations. Twenty-three participants viewed prime images showing comfortable (overhand) or uncomfortable (underhand) initial grasp postures holding a colored bar, followed by target images depicting comfortable (thumb-up) or uncomfortable (thumb-down) final postures. Different action sequences were represented by the prime-target pairs reflecting either physically possible or physically impossible movements. Two task contexts using identical stimuli were employed, an object-related task requiring participants to respond to the top color of the bar, and a grasp-related task requiring classification of the hand posture in the target. Results revealed a task-dependent modulation of ESC congruency. In the object-related task, responses were faster for ESC-congruent targets (thumb-up following underhand primes), but only for physically possible sequences. In contrast, in the grasp-related task, ESC-congruent combinations led to slower responses, independent of physical possibility. These findings indicate that anticipatory activation of future action states is sensitive to task context. Although the underlying mechanisms remain unclear, the results suggest that distinct cognitive processes may contribute to object- and grasp-related action representations.

Keywords: grasping, end-state comfort effect, action anticipation, motor representation, Priming

Neural Correlates of the Sense of Agency: An fMRI Exoskeleton Study

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Sense of agency (SoA), a crucial ability for everyday motor tasks, describes the feeling of being in control of self-generated movements. When internal predictions of motor actions do not match the final outcome, severe irritation and a diminished feeling of control can occur. Hence, this study seeks to gain a deeper understanding of the underlying neural mechanisms of SoA. An MRI-compatible soft exoskeleton on the right hand was used to examine the SoA during different grasping mechanisms in a functional magnetic resonance imaging (fMRI) task. Moreover, subjective SoA ratings were collected. The paradigm included active and passive task blocks, in which participants either actively grasped without any exoskeleton assistance or the exoskeleton fully executed the grasp while participants did not engage in any motor actions. In addition, an assisted condition, in which both the participant and the exoskeleton grasped simultaneously, was included. The study sample consisted of 25 healthy participants. Low subjective SoA ratings were found to be related to the passive condition, whereas high subjective SoA ratings were related to the active condition, with ratings for the assisted condition lying in between. Using an FWE-corrected alpha of 0.05, the active condition, compared to both the passive and assisted conditions, showed significant cerebellar activation, while the passive condition, compared to the active and assisted conditions, showed an angular gyrus activation. These results underline previous research findings associating motor area activation with high SoA and angular gyrus activation with low SoA.

Keywords: functional magnetic resonance imaging (fMRI), exoskeleton, sense of agency (SoA), motor control

Identifying neural correlates underlying motor hysteresis with EEG

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Motor actions, like perception, can be shaped by recent experience. When a previously executed motor plan biases the selection of a current action—such that the motor system tends to repeat the preceding plan—this phenomenon is termed motor hysteresis. Motor hysteresis has been demonstrated across a variety of tasks and is thought to reflect short-term memory traces within motor planning networks. The ongoing study investigates neural correlates of motor hysteresis using a virtual-reality paradigm combined with EEG. Preliminary data is presented. Participants ($n = 13$, mean age = 23.1 years, 7 females) were instructed to intercept balls rolling down an inclined virtual table by pressing a button as soon as a ball reached the catching zone. Balls could appear on one of nine lanes. To evoke hysteresis, we systematically manipulated the order in which lanes were presented: in one condition, balls appeared in an ordered left-to-right or right-to-left progression; in a second condition, they appeared in a pseudo-random sequence. We analysed the response data using a generalized linear mixed model (logistic link). The model revealed significant main effects of lane, $z = 14.928$, $p < .001$, odds ratio (OR) = 48.03, and direction, $z = 2.912$, $p = .0036$, $OR = 2.09$, indicating that participants' motor responses were biased by the recent motor plans. These behavioural findings demonstrate robust motor hysteresis. Thereby, they fulfil the prerequisites for the further analyses of the concurrently recorded EEG data, which will be presented at the conference.

Keywords: brain activity, motor hysteresis, motor planning, decision making, EEG, neural response

Online or offline: Competence does not modulate observationally acquired stimulus-response binding and retrieval effects

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Stimulus-response (SR) bindings can be acquired by simply observing how another person responds to a stimulus. When the same stimulus is encountered again, observationally acquired SR bindings can be retrieved to guide one's own actions. According to previous lab studies, observationally acquired SR binding and retrieval (oSRBR) effects only occur when the observed person is socially relevant to the observer. In contrast, recent studies that investigated oSRBR effects in an online environment found no influence of social relevance, raising the question whether oSRBR effects are less sensitive to social modulations online. However, direct comparisons between face-to-face and online context are complicated by the fact that all studies used different ways to manipulate social relevance. Thus, in our study, we tested the influence of a competence manipulation on oSRBR effects both when participants interacted with their co-actor face-to-face (i.e., in the lab; Experiment 1), and in an online environment (Experiment 2). In both experiments, participants performed an interactive color classification task to assess oSRBR effects. We manipulated whether the co-actor was perceived as competent vs. incompetent by giving scripted feedback on their performance at multiple points during the experiments. We expected to only find oSRBR effects for participants who interacted with a competent partner. Despite successful manipulation checks, oSRBR effects emerged independently of the co-actor's perceived competence in both experiments. This suggests that the sensitivity of oSRBR effects to social modulations does not differ between face-to-face and online interactions, but may instead generally be lower than previously believed.

Keywords: stimulus-response binding, event files, competence, online interactions, episodic retrieval

The Role of Internalized Context in the Retrieval of Prior Action Episodes

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Previous research has demonstrated that additional repetitions of an irrelevant contextual sound can modulate the after-effects associated with retrieving so-called stimulus–response bindings. In an auditory negative priming paradigm, having to respond to a stimulus that previously served as a distractor increases the likelihood of erroneously repeating the response executed on the preceding trial, a phenomenon referred to as the prime-response retrieval (prr) effect that can only be explained by assuming the retrieval of the distractor-response binding upon distractor repetition. Crucially, the prr effect is amplified when an incidental context (e.g., a sine tone) is also repeated. It remains unclear whether this modulation is restricted to concrete contextual stimuli, or whether it extends to more abstract, internalized forms of context.

The current series of experiments used task set as an abstract context within a negative priming paradigm. Task set was either repeated or switched between prime and probe presentations. In Experiment 1 ($N = 61$) and Experiment 2 ($N = 69$), task set was indicated by a written cue in each trial, while task was varied block-wise in Experiment 3 ($N = 75$). In Experiment 1 and 2, the results consistently revealed larger prr effects when the task set was repeated compared with when it changed, while only a tendency for this effect was observed in Experiment 3. These findings suggest that task sets can function as contextual cues, although the results from Experiment 3 also suggest that the physical presentation of the task cue contributes to the observed effect.

Keywords: Stimulus-Response binding, action control, task switching, context

Is visual context an effective segmentation cue in event file integration?

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Stimulus and response features are assumed to be temporarily integrated into so-called event files that are retrieved upon reencountering any of their features, with impaired performance in case of partial repetitions (so-called partial repetition costs, PRCs). Auditory context has been shown to influence the integration of auditory stimulus and response features with stronger PRCs for features that had been surrounded by the same auditory context than for stimulus and response features that had been separated by a different auditory context. The presented experiments tested whether visual context takes on a similar segmenting role during event file integration. In a distractor-response-binding task participants either had to identify shapes that were presented on a colored background serving as context (Experiment 1, $N = 50$) or identify sounds while viewing a colored background (Experiment 2, $N = 50$). The color context either changed between prime stimulus presentation and prime response or stayed the same throughout. PRCs were not influenced by the context manipulation. In Experiment 3 ($N = 58$), we sought to enhance the segmenting function of visual context by introducing a dynamically moving background motif, which was expected to more strongly emphasize the temporal dimension of contextual information. Again, shapes had to be identified in front of the dynamic context that either separated stimulus and response features by color change or maintained a constant color. Yet, there was no modulation of PRCs by context. Unlike auditory context, visual context does not appear to play the same segmenting role in event file integration.

Keywords: event file, S-R binding, integration, context, segmentation

Machine learning based detection of mental fatigue induced by a mouse pointing task: training algorithms on eye-tracking, skin conductance and cardiac data

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Mental fatigue arises from prolonged cognitive activity and is typically associated with cognitive decline and feelings of tiredness and demotivation. Machine learning offers a promising approach for identifying fatigue in individuals, which can help prevent its negative consequences. Previous research has primarily trained algorithms on EEG data, whereas other physiological indicators have been used less frequently. In this study, fatigue was induced by having participants ($n = 28$) complete nine blocks (~30 minutes total) of a visually guided pointing task. Cardiac activity, eye movements, pupil diameter, and skin conductance were recorded throughout the task. Data from the first two blocks were labelled “non-fatigued,” and data from the last two blocks were labelled “fatigued.” Fatigue was identified using supervised classification with leave-one-subject-out cross-validation. As expected, cognitive performance declined and subjective fatigue increased over time. Physiological measures also changed significantly as a function of time-on-task. The random forest classifier achieved an accuracy of 79.46%. Feature selection revealed that skin conductance parameters were the strongest predictors, followed by heart rate variability, fixation instability, and phasic pupil-size changes. These cognitive and physiological changes are in line with previous evidence of motor-cognitive deficits and increased parasympathetic activity under fatigue. Although classification accuracy is comparable to studies using peripheral physiological signals, it remains markedly lower than the ~90% typically achieved with EEG-based approaches.

Keywords: machine learning, mental fatigue, time-on-task, motor cognition, HRV, eye-tracking, skin conductance

The Functional Underpinnings of Performance Fluctuations in Acute Mental Fatigue: an fMRI study

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There has been a substantial increase in scientific investigations into the neural underpinnings of acute mental fatigue (AMF). These functional magnetic resonance imaging (fMRI) studies found that altered activation in the insula, dorsolateral prefrontal cortex, and anterior cingulate cortex is associated with the decline in behavioural performance caused by AMF. Performance changes induced by AMF are often characterized by fluctuations, the functional basis of which remains insufficiently understood. Our study aimed to investigate the neural alterations that might be responsible for these performance fluctuations. We used the 15-minute long Psychomotor Vigilance Task (PVT) to induce AMF through the time-on-task effect, and fMRI to detect the fluctuations in task performance in healthy young people. To capture individual differences in performance stability, the standard deviation of reaction speed (SD Speed) per minute was used for each participant to model performance fluctuations in subject-level fMRI analyses. The 15-minute SD Speed was used as dependent variable in post hoc brain-behaviour regression analyses. Our findings revealed that the task performance fluctuations during the PVT were related to deactivation of three clusters of regions: the right middle and inferior frontal gyri (Cluster 1), the left superior, middle and medial frontal gyri (Cluster 2), and the right precuneus and posterior cingulate gyrus (Cluster 3). Additionally, post hoc regression analysis revealed that increased deactivation in Clusters 1 and 2 predicted higher performance fluctuations during the PVT. Our findings supplement previous ones on AMF as frontal regions are involved in the „cost-benefit” assessment of tasks related to mental fatigue.

Keywords: time-on-task effect, acute mental fatigue, performance fluctuation, fMRI

Impact of exercise training on motor fitness and health-related Quality of Life in elderly

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In elderly, higher quality of life (QoL) is associated with lower overall mortality. QoL, which encompasses physical and mental health, benefits from increased motor fitness (cardiorespiratory fitness). This study investigated which type of exercise is most effective in a 16-week walking training (cardiovascular) vs. a track-and-field athletic training when compared to a toning and relaxation training (active control; two times one hour per week). Motor fitness was evaluated by a six-minute-walk test (from a motoric test battery), QoL by the QoL-SF-36 questionnaire and the geriatric depression scale (GDS) before and after the training intervention in 46 elder participants (age: $M = 64$; female 23; BMI $M = 24$; MoCA $M = 27$); the three groups were matched for socioeconomic factors and motor skills pre intervention. The 2x3 mixed ANOVA with the factors time (pre, post) and group (walking, track-and-field, relaxation) for motor fitness yielded an interaction [$F(2,43)=6.67, p < 0.001, \eta^2=0.02$], and a main effect for time [$F(1,43)=48.08, p < 0.001, \eta^2=0.05$]. For psychological QoL, the same ANOVA yielded only a main effect for time [$F(1,43)=4.21, p = 0.046, \eta^2=0.01$]. For physical QoL there were no significant effects. In addition, the ANOVA for GDS yielded a marginally significant interaction [$F(2,43)=2.93, p = 0.064, \eta^2=0.02$], and a marginally significant main effect for time [$F(1,43)=3.63, p = 0.063, \eta^2=0.01$]. It is suggested that walking improves motor fitness more than track-and-field, and relaxation. All exercise types improve psychological QoL, whereas the experimental groups possibly decreased in their depression scores.

Keywords: Quality of life, older adults, health, exercise training, motor fitness, sport

Mudra-Band as a Tool for Investigating Cognitive-Motor Integration in Finger Rehabilitation

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The Mudra-Band is a wearable remote-gesture-control device originally developed for robotic applications, integrating Bluetooth and gyroscopic tablet connectivity. We adapted its grip-force sensing capabilities to explore cognitive-motor processes in finger rehabilitation and cognitive strategy assessment. Our study employed a modified digital version of the Towers of Hanoi task to investigate how individuals regulate fine motor control under cognitive constraints. Participants used minimal two-finger grip-force to lift and move rings of varying size and colour across three poles, guided by a cursor. Excessive force triggered a simulated “crash”, reinforcing the need for controlled motor execution. A key experimental manipulation involved comparing performance across two conditions: (1) rings differentiated by size (Bottom-Up processing), and (2) rings of identical size differentiated only by color (Top-Down processing). The Mudra system recorded detailed performance metrics including grip-force dynamics, timing, and error events. Behavioural observations captured strategy use and error types. Preliminary results revealed individual variability in reliance on Top-Down versus Bottom-Up processing, suggesting differences in cognitive control and perceptual integration.

We propose that this paradigm offers a novel method for assessing cognitive-motor integration, particularly in populations with brain injury or motor-impairment. In rehabilitation contexts, patients often lose automatic grip-force regulation and must rely on conscious Top-Down control. Our findings suggest that training which transitions from Top-Down to Bottom-Up control may support recovery of automatic motor function.

Future work will examine correlations between task performance and cognitive abilities such as mental rotation and figure-ground discrimination, contributing to a deeper understanding of embodied cognition and neurorehabilitation.

Keywords: Cognitive-Motor Integration, Top-Down Processing, Grip Force Control, Embodied Cognition, Neurorehabilitation

A ghost in the machine: number words influence two-digit magnitude comparison performance in French

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Whether and how language influences two-digit number processing is not yet clearly understood. Previous studies in languages such as English, Polish, German, or Czech have reported modulations of numerical effects, suggesting that number-word structure may shape how multi-digit numbers are processed. The present study investigated whether number-word activation contributes to Arabic multi-digit number processing in French and German. Sixty-four adults (32 French- and 32 German-speaking) performed a two-digit number magnitude comparison task manipulating unit-decade compatibility and number range (below vs. above 60). Results revealed robust Unit-Decade Compatibility Effects in both language groups, with no interaction, suggesting comparable processing across groups. However, within the French sample, reaction times were significantly faster for numbers above 60 than below 60, whereas German participants showed no such difference. We suggest that this pattern may be explained by characteristics of the French verbal number system: its composite forms (e.g., *soixante-dix* “sixty-ten”, *quatre-vingts* “four-twenties”) contain highly frequent number words that are often more practiced, potentially facilitating processing despite their structural irregularity.

Keywords: Unit-decade compatibility effect, number magnitude comparison, number word syntax, number word inversion, base-20 system, cross-linguistic comparison

Fuzzy Boundaries and Compressed Scales in Quantity Representation: Quantifiers vs. Numbers

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In everyday language, quantities can be expressed with exact numbers or with quantifier words like “few” and “many”; non-numerical quantifiers are inherently more vague than numerical expressions. To investigate how this vagueness shapes the mental representation of non-numerical quantifiers, we administered two tasks to two independent groups of 35 participants. In the first task, participants viewed images depicting varying proportions of targets (animals) and non-targets (objects) and selected the most appropriate quantifier from a set of five. In the second task, using the same type of images, participants judged whether a displayed quantifier matched the scene. Across both tasks, the results revealed an ordered representation of quantifiers. However, in the second task, the category boundaries were much less clearly defined, with substantial overlap among the distributions associated with each word, indicating that their meanings lack sharp boundaries. Interestingly, in both tasks, the organization of quantifiers followed a logarithmically compressed scale: smaller quantifiers displayed more distinct and widely separated distributions, whereas larger quantifiers showed greater overlap. This pattern is consistent with how humans mentally represent non-symbolic quantities and Arabic numerals.

Keywords: quantifiers, semantics, numerical cognition

Two-digit number processing is decomposed and not analog: A meta-analysis of the unit-decade compatibility effect.

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Multi-digit number processing was long considered to be based on an analog holistic representation of magnitude. In 2001, however, the unit-decade compatibility effect was published, which suggested decomposed processing and facilitated an international research agenda on place-value representations and processing. The unit-decade compatibility effect describes that responses to incompatible pairs (47_62; decades and unit comparisons lead to different decisions) take longer and are more error-prone than those to compatible pairs (42_57; decades and unit comparisons lead to the same decision). Now, after 25 years, we conducted a quantitative meta-analysis to examine the strength and homogeneity of the unit-decade compatibility effect. We consulted two major databases, which lead to 154 articles. After removal of duplicates and having excluded all studies that were irretrievable or failed to meet our inclusion criteria, we included 63 studies and 68 experiments in our final analyses. The average effect size from 56 experiments, where effect size was provided or could be derived, was $\eta^2 = .37$. However, individual effect sizes varied strongly depending on factors related to study design and on sample characteristics leaving space for moderator variables or other biases. Overall, this meta-analysis suggests that the unit-decade compatibility effect has a large and significant effect size, however, it is modulated by other relevant variables. Consequently, the unit-decade compatibility effect is well-suited to investigate place-value processing alongside its potential moderators.

Keywords: unit-decade compatibility effect, meta-analysis, place-value, multi-digit number processing, numerical cognition

The role of spatial attention in multisensory causal inference

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Attention plays a key role in how the brain integrates information across the different senses for multisensory perception. Humans integrate information if they infer that the signals arose from a common cause, but they segregate information from independent causes. Still, how spatial attention influences these causal inference processes remains unclear. To address this, we employed a variant of the classical spatial-cueing paradigm (Posner, 1980) to investigate how exogenous and endogenous attention modulate audiovisual perception. Participants ($n = 20$) completed three sessions (~2.5 h each), comprising 24 runs of audiovisual and unisensory trials. Exogenous attention was manipulated via briefly flashed cues (50% validity), and endogenous attention via arrows (75% validity). Subsequent audiovisual spatial target stimuli were presented independently at six horizontal locations, and participants selectively localized either auditory or visual targets.

Behavioral analyses focus on crossmodal bias (CMB) as a function of cue validity, spatial disparity, and task relevance, separately for exogenous and endogenous attention. Preliminary results suggest that CMB shows the key pattern of causal inference, that is, stronger integration for audiovisual signals of small as compared to large disparity. This key pattern is most pronounced for auditory targets, which show particularly strong visual biases. The validity of exogenous and endogenous cues further modulates this effect.

Our results suggest that exogenous and endogenous attention interact with causal inference processes. The study provides a comprehensive characterization of how spatial attention shapes multisensory integration, paving the way for neuroimaging studies linking attention-driven causal inference to its neural dynamics.

Keywords: multisensory, audiovisual, perception, crossmodal bias, cognitive, attention, causal inference

The interplay of attentional resources and multisensory causal inference

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To obtain coherent multisensory representations, humans integrate sensory signals if they infer a common cause, but they segregate signals from independent causes. Yet, it is unclear how such causal inference (CI) processes depend on attentional resources. Here, we employ a dual-task paradigm in which participants ($n = 40$) selectively localize auditory or visual spatial targets (primary task) while performing a visual multiple object tracking (MOT) task (secondary task) to manipulate attentional load. AV targets appear at three horizontal locations, with visual reliability of the V targets manipulated via narrow (2° STD) or broad (7° STD) Gaussian dot clouds. The MOT task varies in load (1 vs. 3 targets), and catch trials ensure compliance with the task.

Behavioral analyses examine crossmodal bias (CMB) as a function of spatial disparity, visual reliability, task relevance, and attentional load. Computational modeling compares a Bayesian CI model to heuristic alternatives to quantify how load modulates integration. EEG multivariate pattern analyses compute a relative audiovisual weight index on decoded spatial representations across time. We hypothesize that higher load weakens the effects of spatial disparity and visual reliability on CMB, and diminishes segregation of the task-irrelevant signal. CI modeling should show lower causal priors under high load. EEG audiovisual weight indices should reveal early effects of spatial disparity and visual reliability, and later interactions between task relevance and disparity, with stronger effects for low-load conditions.

This study will combine behavioral indices, computational modeling, and neural dynamics to gain a deeper understanding of how attentional resources modulate multisensory causal inference.

Keywords: multisensory, audiovisual, perception, crossmodal bias, attentional load, causal inference, attention

A needs-based Research Data Management Course

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Research data management (RDM) is an important part of any researcher's work, and good RDM is essential for the reusability of data. While a number of RDM courses already exist, most of them are generic and do not address the specific needs of psychologists. This aligns with anecdotal feedback conducted in workshops within the context of RDM projects (Blask, 2021, 2022, Blask et al., 2023). The aim of the present project is to design an RDM course specifically addressing the needs of psychological researchers, which would help researchers to design an RDM pipeline aligned with their already existing research pipelines. To this end, the needs of psychological researchers at all levels and (quantitative) sub-disciplines must be adequately assessed. In order to assess these needs, one strategy which we aim to follow with the present submission is to collect feedback from a large number of researchers on their perceived RDM training needs. Feedback will be collected for three main questions; firstly, to what extent participants already implement RDM practices in their own research, secondly, what are their perceived difficulties in implementing those practices, and finally, whether there is any specific content or tool that should be prioritised so that they would benefit from it. The feedback will then be used to inform the design of an RDM training course that adequately meets the needs of quantitative psychological researchers.

Keywords: research data management, FAIR principles, open science

Rearranged Reality: Spatial Memory for Virtual Objects in a Shifting Physical World

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In Augmented Reality (AR) applications, virtual objects are often placed near to real-world objects like walls, furniture or bulletin boards. Little is known about how users mentally represent this spatial relationship between virtual and real objects - and how spatial memory is affected if the reference objects in the real world are moved. This study investigates how changes in the position of physical reference objects influence users' memory for the locations of virtual objects. Users viewed and rated 18 AI-generated images presented as virtual objects via AR (Meta Quest 3) in a fully furnished room while incidentally memorising the objects' locations. After a delay of 2-3 days, participants returned to the room where some of the physical furniture had been moved. They had to place the virtual objects at the remembered locations.

Our results show that participants mentally represent the locations of the virtual objects in relation to nearby physical reference objects, even if the locations are task-irrelevant: When the physical reference objects are moved, they placed the virtual objects at locations that are moved in the same way as the underlying furniture. This research lays the groundwork for follow-up studies that examine the use and influence of properties of the physical space in tasks where users create their own spatial layouts of virtual objects. Additionally, it will inform the design of AR applications that rely on connections between the real and virtual world under real-world variability.

Keywords: augmented reality, mixed reality, spatial cognition, memory

A Bayesian Hierarchical Workflow for Individual Differences

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When assessing individual differences in experimental psychology, we often ignore the hierarchical structure of the data. This omission may lead to unstable person-level estimates and attenuated correlations. To address these issues, Bayesian hierarchical modelling has been proposed to account for sample noise on the trial level and to improve estimation of correlations between experimental tasks. We present a Bayesian hierarchical workflow for individual differences that aims at guiding experimental psychologists in optimal measurement of person-level parameter and correlation estimates. The first part of the workflow covers applying existing cognitive or psychometric models, the second part outlines steps for developing new models. Based on previous Bayesian workflows, we describe key steps such as prior predictive checks, computational faithfulness, model sensitivity, parameter recovery, and posterior predictive checks. The new focus is on the estimation of between-subject variability and correlations which comes with its own set of challenges.

Prior prediction is used to assess whether a model can produce sensible group- and individual patterns, ensuring that the model's assumptions allow realistic between-subject variability. Computational faithfulness ensures correct posterior sampling and involves checking computational diagnostics. Model sensitivity, the Bayesian version of power analysis, checks if sample sizes (number of participants and trials) are sufficient to avoid high uncertainty about parameter estimates. Parameter recovery tests whether model parameters are identifiable and reliable. Finally, posterior predictive checks evaluate how well the model fits data and reproduces observed patterns. We provide a template with reproducible reports to enhance transparency and robustness in hierarchical cognitive modeling analyses.

Keywords: hierarchical models, bayesian modelling, individual differences, reproducibility

Bringing Ecological Validity to Sound: A Standardized Audio Stimulus Set with Participant-Grounded Labels

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Research in cognitive neuroscience has traditionally relied on simple, highly controlled stimuli due to the difficulty in developing standardized, ecologically valid stimulus sets. However, recently, there has been a consensus that using ecologically valid stimuli is imperative to generalize results beyond controlled laboratory settings. The current study presents a naturalistic audio stimulus database that meets the specific requirements of cognitive neuroscience for short, recognizable, and emotionally rated stimuli. To create such a database, the current study collected 291 audio files from a wide range of sources. 361 participants rated the audio clips on emotionality, arousal, and recognizability, and subsequently freely described the audios by typing what they believed the sound to be. The text responses of the participants were embedded and clustered using an unsupervised machine-learning algorithm to derive a participant-grounded organization of auditory object categories. The results indicate that the participants were confident of their ability to recognize the audios, while emotionality and arousal ratings showed broad variability, enabling future researchers to select stimuli that best suit their experimental needs. Furthermore, the final database comprises ten distinct semantic categories, providing a diverse set of auditory stimuli. Going beyond its experimental utility, the current study offers a methodological framework that can be replicated to develop other types of stimulus sets.

Keywords: Audio database, unsupervised classification, standardized audio files, hierarchical classification

Putting Attentional Control to a Normative Test

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Attentional control deficits are often invoked to explain individual or aging-related differences in how people allocate attention. Yet what constitutes optimal attentional allocation, and how closely human behavior approximates it, remains poorly understood. We introduce a novel paradigm designed to test how people select attentional strategies in a prototypical allocation context. In each trial, participants could maximize piece-rate earnings by focusing on a primary task or, at a cost to earnings, check cues indicating which of two primary tasks was currently rewarded. Normative modeling of allocation/value functions revealed wide variability in optimal strategies across decision contexts, but also relatively flat utility surfaces, implying weak normative constraints. The relative time cost of checking the cues emerged as a key normative determinant of allocation differences across individuals and age groups. Empirically, participants were less sensitive to most decision variables than the model predicted, yet they showed pronounced individual and aging-related differences. Consistent with normative predictions, these differences were largely explained by variations in relative cue-checking costs: Because older adults were slower on the primary task, but not in cue checking, their effective cue-checking costs were smaller. This led to more frequent cue use. We argue that a normative framework clarifies when attentional differences reflect adaptive, cost-sensitive optimization rather than control deficits, and outline testable implications for further research on how people allocate attention.

Keywords: attention, aging, normative modelling

The cocktail party effect in children: Two classic results and a new one

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This poster presents a preregistered replication of the classical cocktail party phenomenon in children, investigating attention scope and control during elementary school years. How often should children notice their own names in an ignored speech channel? A priori, either direction of difference from younger adults could be expected, one effect based on the scope of attention (children should notice their names less often because of their lower capacity to apprehend multiple items simultaneously), and the opposite effect based on the control of attention (children should notice their names more often because of their poorer ability to suppress information in the irrelevant channel). A retrospective questionnaire indicated that 29 percent of the younger group (6.4 years), 43 percent of the middle group (8.2 years), and 25 percent of the older group (11.7 years) noticed their own name and those who did made more shadowing errors shortly after the presentation of the name, with no simple developmental trend and no relation to individual differences in working memory capacity.

Keywords: Selective attention, working memory, cognitive control, dichotic listening

Oscillations in information sampling for transsaccadic object correspondence

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Peripheral vision enables the detection of potential targets for subsequent foveal inspection via saccadic eye movements. The integration of pre- and postsaccadic visual information relies on transsaccadic object correspondence (TOC), which determines whether two retinal inputs are perceived as originating from the same object. Successful TOC depends on various object features—such as shape, color, texture, location and perceptual completion. However, the temporal dynamics and neural correlates of TOC remain poorly understood. In the present study, we employed a postsaccadic target selection paradigm using an oriented Gabor patch as the presaccadic target. The patch's orientation fluctuated every 25 ms until participants initiated a saccade towards it. Orientations were drawn randomly from a Gaussian distribution with a mean orientation rotated either clockwise or counterclockwise relative to vertical. Upon saccade onset, two static postsaccadic candidates appeared, one of which shared the mean orientation of the presaccadic target while the other one showed the vertically mirrored orientation. Participants were asked to make a second saccade to the matching candidate and to also choose the matching candidate via button press. To identify which presaccadic time window contributes to a successful TOC, we performed a millisecond-resolved receiver operating characteristic (ROC) analysis on the presaccadic orientation sequence. This analysis quantified how instantaneous orientation noise influenced subsequent saccadic and manual target selection. The resulting temporal profile revealed oscillatory fluctuations, indicating rhythmic modulation of noise influence on TOC. These oscillations may reflect underlying neural mechanisms related to attentional sampling and transsaccadic integration.

Keywords: saccades, object correspondence, target selection, attentional oscillations, ROC

Links Between Mental Fatigue, Attention Networks, and Psychological Traits

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The Attention Network Test (ANT) is a well-established paradigm for assessing the three attention systems of the Posnerian model: alerting, orienting, and executive networks. Yet most studies have failed to elicit mental fatigue in the form of objective performance deterioration, even when using prolonged ANT versions. This study examined a modified ANT to induce fatigue and explored the differential effects of fatigue on the three systems. Eleven healthy adults completed personality and impulsivity questionnaires and reported on their current mental (e.g. state anxiety and depressive symptoms) and physical state before performing a 45-minute ANT. The protocol successfully induced both subjective and objective fatigue, as reflected in increased visual-analogue fatigue ratings and performance decline in the form of reaction time increases. Although the three attention systems showed different tendencies throughout the task, they did not appear to be affected differently by time on task, as reaction times increased similarly across trial types. However, it is plausible that individual differences underlie this pattern, as the fatigue sensitivity of the respective systems depended on cognitive, affective and personality variables. Specifically, the decline in executive attention over time correlated negatively with depressive symptoms and positively with cognitive impulsivity and attention-deficit scores. Deterioration in the orienting network correlated negatively with impatience. These findings suggest that the effects of mental fatigue are more generalized across the systems, rather than exerting their influence through a single system. However, the systems show individual differences, and exhibit distinct cognitive and affective correlates.

Keywords: Mental fatigue, Attention Network Test, Executive control, Time-on-task, Impulsivity

Not So Stable: Paradigm-Dependent Variations in Sign- and Goal-Tracking Behavior

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Inter-individual differences in approaching reward cues as compared to rewards are referred to as sign- and goal-tracking behaviour. Goal-trackers approach the location of reward delivery, while sign trackers show a stronger focus on the location of the cue. While interest in these patterns has recently increased and tracking behaviour is usually categorized based on gaze behavior, no study has systematically investigated different variations of the paradigm. The main goal of the current study was to explore how the position where cue and reward were presented influence sign- and goal-tracking tendencies $N = 38$ participants completed a computerized Pavlovian Conditioned Approach task (with and without interactive components) in which the positions of the cue and reward (upper vs. lower screen location) were systematically varied. Based on gaze behavior towards the cue and reward positions, a gaze index was calculated to determine attentional biases towards different (cue vs. reward) locations. Analysis of the gaze behavior revealed a significant effect of position in the task without interactive component. Participants fixated the cue longer and faster if the cue was presented in the lower position of the screen compared to the upper position, while the reward location was fixated longer and faster if the CS was presented in the upper position. These findings challenge the assumption of the sign- and goal-tracking model that these tendencies represent stable, trait-like patterns, by demonstrating position-dependent shifts in gaze behavior.

Keywords: sign-tracking, goal-tracking, eye tracking, Pavlovian conditioning, reinforcement learning, human

Orthographic Learning and the Self-Teaching Hypothesis: A Crosslinguistic Experimental Investigation

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We examine orthographic learning and its variation across four languages with differing orthographic depths: English, German, Spanish, and Turkish. Orthographic word learning refers to individuals acquiring novel words' spellings and storing their representations in their mental dictionary (Ehri, 2013). We designed an experimental learning task, where participants learn the spellings of novel pseudowords. To understand what influences orthographic learning, we manipulated orthographic depth, which reflects how consistently a word's letters map onto sounds in a given language (Katz & Frost, 1992), and orthographic typicality, how closely a word's spelling matches the typical letter combinations in the target language (Woollams et al., 2010). The participants were 186 adults who were native speakers of English, German, Spanish or Turkish, which vary in orthographic depth. We presented 40 pseudowords to our participants, with each seeing either 20 novel items or their 20 homophone pairs (words that are pronounced the same but spelled differently). Half of the items were spelled according to the orthographies' spelling conventions, and the other half had atypical spellings. We found no effects of orthographic depth or typicality; however, similarity to real words in the respective languages strongly predicted performance across tasks. This study was the first to compare languages with different orthographic depths using identical pseudowords while including typicality and orthographic similarity, providing a framework for future cross-linguistic work.

Keywords: orthographic learning, Self-Teaching Hypothesis, Dual-Route Framework

Which finger, which key? The role of finger-key-mappings on the expression of sequence knowledge

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The serial reaction time task is often used to research (implicit) sequence learning. There is an ongoing debate about what exactly is learned in the task. Is it the (spatial) sequence of the stimuli, the sequence of motor responses or the (spatial) sequence of keys used to answer? Although there are studies showing evidence for each of the learning possibilities as well as their combination (visuomotor learning, Pedraza et al., 2023 or feature codes, Haider et al., 2020), studies using motor responses seem to show stronger expressions of sequence knowledge. Thus, the expression of learned knowledge could benefit from the response format. The present study tries to disentangle the relevance of motor responses and the spatial layout of the keys for the expression of sequence knowledge. To this end four conditions are tested in which a learning phase and a transfer phase are presented with different combinations of finger-key-mappings. In the first two conditions, the specificity of the finger key mapping is varied. Either each finger is assigned to a certain key or the participants are asked to press different keys with the same finger. In the second two conditions, the spatial configuration of the keys is changed. Either the spatial configuration is horizontal or vertical. The expression of sequence knowledge is compared between the learning and the transfer phases in the four conditions.

Keywords: Sequence learning, serial reaction time tasks, SRT, finger-key-mapping, learning

The role of visual imagery in long-term memory of natural scenes: Perspectives on memory span, fidelity and precision

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Visual mental imagery refers to the ability to generate quasi-sensory representations in the absence of corresponding visual input. Although substantial inter-individual variability in imagery vividness has long been documented, the complete absence of visual imagery—known as *aphantasia*—has only recently received systematic attention. While *aphantasia* has been linked to modest impairments in tasks that tax visual imagery, such as visual working memory, these differences are often attenuated by the adoption of compensatory, non-visual strategies. However, it remains unclear whether such strategies can support performance in short and long-term visual memory tasks, where visual imagery may facilitate the retrieval of encoded perceptual details. In this study, we approach this question by comparing short and long-term memory performance for a complex visual scene in individuals with *aphantasia* and those with typical imagery. To enhance ecological validity, participants freely view a realistic room scene on the screen for two minutes and were encouraged to use their preferred encoding strategies. Their memory is subsequently assessed using four measures: (1) object memory span, (2) memory fidelity through detailed object descriptions, (3) spatial precision via free-recall drawing, and (4) mnemonic precision through a scene reconstruction task requiring selection of target objects and rejection of lures. Preliminary results from these analyses will be presented and discussed.

Keywords: visual mental imagery, natural scenes, memory, *aphantasia*, eye tracking, drawing, free recall

Transfer of learning via varied and constant retrieval practice

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The effectiveness of retrieval practice in supporting learning can be enhanced if retrieval cues are varied across learning cycles. This has been previously demonstrated in a study examining foreign vocabulary acquisition and contrasting varied and constant sentences with embedded to-be-learned foreign words, where sentences were used to prompt retrieval of the meanings of those words. However, to date the benefits of variable over constant retrieval were assessed solely in an explicit test of the meanings of the learned foreign words. In contrast, the present study assessed whether variable retrieval yields benefits over constant retrieval also in transfer tests that require the understanding of the meanings of foreign words but do not ask for those meanings directly. In a series of experiments, this was assessed with the use of a semantic relatedness task, which required speeded decisions as to whether foreign words were semantically related or unrelated to the preceding primes, and a sentence verification task, which required decisions as to whether foreign words fit into semantic contexts of novel sentences. The obtained results confirmed the superiority of learning via varied over constant retrieval practice also for the transfer tasks, suggesting that varied retrieval practice leads to effective embedding of the learned words in semantic knowledge structures.

Keywords: learning, retrieval practice, encoding variability

Flankering the Surround-Target: Investigating the Negative Congruence Effect of Letter Recognition

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Lachmann and van Leeuwen's research over the last two decades has shown that visual context affects letter identification differently than visually similar pseudo-letters and shapes (non-letters). By comparing isolated targets and targets surrounded by congruent and incongruent shapes, they found that shapes and pseudo-letters typically benefit from congruent surrounds relative to the isolated baseline, whereas letters show a negative congruence effect, i.e., accuracy and speed are reduced in the congruent condition while incongruent surrounds produce positive or neutral congruence effects. This finding points to categorical differences in processing: letters rely on highly practiced, automatized, analytic representations that conflict with the grouping tendencies induced by congruent surrounding shapes, whereas non-letters are more susceptible to holistic integration with the surrounding context. In the present study, we test whether these effects can be modulated when the visual context is altered through additional flankers. In a speeded letter-versus-non-letter identification task, we manipulate surround congruency (congruent vs. incongruent) and flanker condition (none, two flankers, four flankers). We hypothesize that flankers may form a broader contextual structure, making the central letter more isolated and thereby reducing or eliminating the influence of the surrounding shape. We report preliminary findings on how immediate and expanded context shape letter perception.

Keywords: visual context; congruence effects; feature integration; flanker; letter recognition; reading; Gestalt;

Does Global Context Volatility Affect Context-Specific Proportion Congruency Effects?

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The context-specific proportion congruency (CSPC) effect denotes smaller congruency effects in a context containing mostly incongruent trials (MI trials) compared to a context with mostly congruent trials (MC trials). In this experiment, we investigated how the global context volatility, manipulated by the switch rate between MC and MI contexts, affected the size of the CSPC effect. We used a 4-alternative forced-choice face-name Stroop task, and the lower location was always the MC and the upper location the MI context. In different blocks, we measured CSPC effects when the global context volatility was low, medium, and high. The order of volatility levels either increased or decreased across the experiment and was counterbalanced between participants. Results showed a large CSPC effect in the low-volatility condition, which strongly decreased as volatility increased, exclusively for the group starting with the low-volatility context. Here, a significant CSPC effect was observed only at the low but not at the medium and high levels. For the group starting with the high-volatility context, the CSPC effect was not modulated by the different volatility levels. In fact, the CSPC effect was not reliably present in either the high or low volatility contexts but reached significance only at the medium level. These findings suggest that an initial experience of a stable context with few switches between MC and MI contexts supports the learning of context-control associations. Beginning with a high-volatility context, characterized by frequent switches between MC and MI, may limit the learning of these associations.

Keywords: cognitive control, control adaptation, proportion congruency, congruency effect, CSPC

Conflict adaptation in a confound-minimized face-word Stroop task: Exploration of parameter space for studying neural mechanisms

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Conflict adaptation refers to the dynamic adjustment of cognitive control to reduce interference on subsequent trials. Its neural mechanisms are often studied by assessing the congruence sequence effect (CSE) in face-word Stroop tasks during neuroimaging. The present study aimed to address two key methodological issues when using standard response conflict tasks in fMRI settings: Ensuring the involvement of cognitive control in the CSE and demonstrating its temporal stability across varying inter-trial intervals.

In a set of five experiments, using an adapted version of the face-word Stroop task, participants performed either a gender categorization (Experiment 3) or responded to the learned identity of four faces while ignoring the printed name (all other experiments). We specifically incorporated recent advancements in confound minimization to exclude effects of feature integration and contingency learning, included a priming component to further increase the involvement of cognitive control, and used a variable range of inter-trial intervals to test for potential applicability in fMRI research.

Although a robust Stroop effect of about 50 ms was consistently observed across all experiments, a strong CSE emerged specifically in the gender categorization task. In the confound-minimized face-word Stroop variant, a significant CSE occurred only under specific conditions (e.g., sufficiently long target presentation, bi-manual responses) and was accompanied by substantial inter-individual variability. Therefore, while we observed a reliable CSE in a confound-minimized face-word Stroop task with long inter-trial intervals, the increased methodological rigor that improves precision and interpretability also adds complexity and yields smaller and more variable effects.

Keywords: cognitive control, conflict adaptation, conflict, congruency sequence effect, Stroop task, fMRI

Can diffusion models of conflict tasks account for auditory flanker effects?

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The ability to filter task-irrelevant distractors that are conflicting with a current task is a fundamental function of selective attention. One of the most prominent tasks for investigating response conflicts in the visual domain is the Eriksen flanker task in which a central target is paired with a distractor that is either associated with a conflicting response (incompatible) or a compatible response. The response conflicts are then measured as differences in response times and error rates between incompatible and compatible trials. Rather than comparing only mean differences, diffusion models account for the entire process of response conflict. While there is evidence that auditory flanker effects are based on a similar conflict mechanism as in the visual modality, it is unclear to what extent diffusion models are able to account for the conflict process in the auditory domain. The present study investigates this by fitting the diffusion model of conflict task (DMC) and the shrinking spotlight model (SSP) to visual and auditory data using the dRiftDM package for R. Both models revealed longer encoding processes, prolonged but weaker response conflicts and slower evidence accumulation for the auditory modality while the amount of evidence required to make a decision did not differ between modalities. The DMC was found to generally overestimate auditory conflict effects, while the SSP overestimated the conflict only for the fastest responses. Consequently, the SSP provided the better fit for auditory conflict effects.

Keywords: auditory flanker effects, visual flanker effects, diffusion models of conflict tasks

Reversing the Deictic Ground: Interactions of Time and Space along the Sagittal Axis

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The conceptual link between time and space has been extensively discussed in theories of embodied cognition and conceptual metaphor, claiming that abstract domains like time are grounded in more concrete domains like space (Lakoff & Johnson, 1980). Within this framework, temporal relations are often expressed through spatial mappings within a deictic (ego-centered) frame of reference — for example, along the sagittal body axis, the future may lie “ahead” of us, while the past is “behind” (Clark, 1973; Boroditsky, 2000). The present experiments investigate the association of time and space along the sagittal axis by asking participants to physically sort temporal (e.g., now, later) and spatial (e.g., near, far) adverbs along a spatial layout extending from their own body (the deictic center) into space. In the first two experiments, participants consistently sorted both temporal and spatial adverbs congruently along this axis: words like “far” and “later” were placed farther away, while “near” and “now” were located closer to the self. In the third experiment, we manipulated the participants’ frame of reference: the experimenter pre-sorted one dimension (time or space) either in a spatially congruent or an incongruent (e.g., “far” placed at the “close” position) manner, and participants then sorted the other dimension. The results revealed an asymmetric interaction—temporal demonstrations had a stronger impact on participants’ spatial sorting than spatial demonstrations had on temporal sorting. This finding challenges the traditional view that spatial thinking unidirectionally determines how we mentally represent time and suggests instead that temporal structure can also affect spatial conceptualizations.

Keywords: embodied cognition, spatial–temporal mapping, deictic center, conceptual metaphor, temporal language, frames of reference

Aberrant frontal theta phase-based connectivity as marker of impaired cognitive control in schizophrenia

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Schizophrenia is associated with cognitive deficits affecting daily life. The dysconnectivity hypothesis of schizophrenia postulates that disrupted neural communication patterns are causal for the onset of various symptoms. In the present study we examined the functional connectivity in the electroencephalogram (EEG) between fronto-medial and fronto-lateral sites since prefrontal lobe areas are associated with executive functioning. The connectivity was quantified by the inter-site phase clustering (ISPC) representing the consistency of phase angles of two oscillatory processes. The ISPC was analyzed in the theta frequency range being related to cognitive control processes. 29 patients suffering from schizophrenia (SZP) and 29 matched healthy controls (HC) performed a Go/NoGo task while an EEG was recorded. SZP showed worse Go/NoGo performance (d'). Regarding the phase-based connectivity, the NoGo trials elicited a generally higher ISPC than the Go trials. A group difference was only detectable on at a descriptive level (HC>SZP), the interaction of condition and group was not significant. In separate analyses within groups, in SZP an increase of ISPC in the NoGo trials was positively associated with performance (d'), whereas in the HC group an increase of ISPC was negatively correlated with performance. Taken together, the differences in theta phase-based connectivity between fronto-medial and fronto-lateral sites may reflect the levels of conflict detection and compensatory top-down control. SZP reaching a higher level of connectivity were able to perform better in response inhibition, whereas in HC a strong increase in ISPC may reflect an overly activated cognitive control system, which is detrimental to task performance.

Keywords: cognitive control, coherence, phase synchronization, psychiatric disorder

Voluntary control of response times: The case of slowing down (instead of speeding up)

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Recent research on voluntary action control in our lab has focused on a) the impact of effort mobilization and reward on the speed-up of action control and b) the question of whether effort may be recruited to optimize response accuracy. In the present study, we systematically examined the ability to control temporal characteristics of our actions by instructing participants to voluntarily slow down response onset in a systematic manner. Participants were instructed to issue speeded (key release) responses in a baseline condition. Then, they were instructed to comply with specific target response times (e.g., 300, 400, 500 ms etc.) in blocks of trials based on trial-wise response time feedback. We then quantified the ability to voluntarily target these particular response times. The results indicate that shorter (vs. longer) target response times were associated with a systematic temporal overshoot, and that participants were about equally quick to comply with the target time across conditions. These data complement previous research on mechanisms of voluntary action modification by focusing on slowing down (instead of speeding up) temporal response parameters. The findings are additionally interpreted with regard to fundamental assumptions of two-system theories of action control, potentially challenging the underlying assumption of two qualitatively different response modes (fast and slow).

Keywords: Voluntary Action Control, Response Time, Feedback-Based Control

Development of Error-Related Event Related Potentials over the Course of Childhood and Adolescence – A Preliminary Meta-Analysis of Cross-Sectional Research

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Performance monitoring, as indexed by the error-related negativity (ERN) and feedback-related negativity (FRN), is assumed to show systematic developmental changes across childhood and adolescence. While the ERN amplitude increases, reflecting enhanced internal error processing, the FRN amplitude decreases, suggesting a diminished role of external feedback. These trajectories are thought to reflect the maturation of anterior cingulate and dopaminergic systems which support the internal modeling of task demands and autonomous behavioral adjustments. However, electrophysiological studies vary considerably in methodology and sample characteristics. The present meta-analytical review synthesizes cross-sectional evidence on developmental changes in ERN and FRN amplitudes. It investigates whether these changes are robust across tasks or modulated by methodological variables to clarify whether developmental trajectories of performance monitoring reflect task-general neurocognitive maturation or task-specific factors. A preliminary meta-regression of $k = 19$ studies including 49 samples ($n = 1243$) does not reveal significant overall changes in ERN amplitude among minors. The inclusion of the interaction between age and task reduces residual heterogeneity ($LRT(6) = 16.78, p = .010$), but no individual interaction term is significant. Similarly, an analysis of $k = 7$ studies comprising 12 samples ($n = 378$) does not confirm an overall FRN amplitude change, and the age trend is not moderated by task. Overall, these results do not provide clear evidence for developmental changes in ERN or FRN amplitudes. Yet, the preliminary analyses remain inconclusive, as the models do not fully account for the multilevel data structure and between-study heterogeneity, more advanced modeling approaches will be discussed.

Keywords: development, performance monitoring, event related potentials, meta-analysis

Do Emotional Stimuli Enhance Cognitive Control?

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Cognitive control is a central human ability. It enables goal-directed behavior even when encountering distractions on the way. There is a large body of research investigating a potential influence of affect on cognitive control as emotional processes may impact the resolution of response conflict. In a seminal study, Kanske and Kotz (2010) investigated whether and how emotional stimuli influence control by combining a color-word Flanker Task with task-irrelevant emotional and neutral words. Across six experiments cognitive control (indicated by a reduced congruency effect) was enhanced for both positive and negative compared to neutral word stimuli. In this project, we conducted a conceptual replication ($N = 383$). Four experiments investigated the proposed effect and tested potential moderators, e.g., attention to the emotional words, type of employed conflict task, temporal spacing of trials, and testing conditions (online vs. laboratory). Although overall consistent congruency effects and a small, but significant effect of emotional words on performance were observed, the critical modulation of control by emotional words could not be replicated. These findings question the robustness of emotional-driven control as implemented by Kanske and Kotz (2010). Further, they encourage future efforts to replicate other emotion-control interactions and, more broadly, suggest the need for a theoretical framework that explains when and how external emotional stimuli moderate internal affective signals.

Keywords: cognitive control, affect, conceptual replication

Quantifying the Reliability of Browser-Based Speech Onset Measurement for Online Language Production Experiments

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Accurate detection of speech onset is critical for studying the time course of language production. Recent work shows that classic effects such as semantic interference (~20 ms) can be replicated in online picture-word interference and naming paradigms, suggesting that web-based voice-onset measures can be sensitive to small differences. What remains largely unknown, however, is how accurately browser-based systems map real acoustic onsets onto recorded reaction times. We go beyond effect replication and provide a direct calibration of online speech-onset measurement. Across two browser-based experiments, we programmatically simulate vocal responses and compare the intended onset of the sound to the measured onset logged by the experiment software. In Experiment 1, we use pure tones presented at controlled delays after stimulus onset to quantify systematic offsets, jitter, and the correlation between scheduled and recorded onset times. In Experiment 2, we repeat this approach with naturalistic speech recordings that mimic picture-naming responses, testing whether speech-like amplitude envelopes and phonetic structure introduce additional variability. Both experiments use the same timing and recording pipeline as a typical online language production study and are run across several common browsers. By quantifying the precision and consistency of browser-based voice-onset detection, this work offers an assessment of how trustworthy online speech timing measures are at the millisecond scale.

Keywords: speech onset detection, web based psycholinguistics, online reaction time measurement

The multidimensional nature of semantic transparency in a cross-linguistic perspective: Evidence from human intuitions, computational estimates and processing data for Chinese compounds

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Semantic transparency is a key construct for understanding how complex words are represented and processed in the human brain, yet it has been conceptualized and operationalized in diverse ways across studies. In this study, we validate the multidimensionality of this construct in Mandarin Chinese. We first construct a comprehensive database consisting of 2,675 nominal compounds, including human ratings at both the constituent and the compound levels and computational estimates from traditional distributional semantic models (DSMs) as well as large language models (LLMs). We then tested how these diverse measures predict lexical decision performance.

Our factor analysis reveals that semantic transparency in Chinese is fundamentally multidimensional, with measures concerning semantic contribution of each constituent and semantic predictability of overall compounds representing distinct factors in the latent structure. Critically, these derived composite factors, particularly measuring semantic contribution of the second constituent, significantly predict semantic transparency effects. Our work extends the cross-linguistic validity of the multidimensionality hypothesis, previously established in English and German, to Mandarin Chinese. Additionally, we found that LLMs provide more closely aligned ratings for compound-level transparency, while DSMs retain advantage for the constituent-level transparency, providing methodological suggestions for using computational estimates to augment psycholinguistic datasets on semantic transparency.

Keywords: semantic transparency, multidimensionality, lexical processing, Chinese compound, language models

The Cognitive Magic of “Not”: Does Negation Promote Abstraction?

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Negation is a fundamental feature of human language, enabling individuals to reject or deny propositions. Processing negation is cognitively demanding, as it requires the construction of alternative mental representations. For instance, encountering the phrase “no apple” may prompt consideration of the broader category “fruit”, suggesting that negation might foster more abstract or higher-level thinking. Further, theories of grounded cognition propose that affirmative statements rely on perceptually grounded representations, whereas negations demand additional inferential processing that distances thought from direct sensory experience. This distancing may foster more abstract conceptualization. For example, in German, when completing the sentences “Julia spaziert mit einem ...” (Julia is walking with a ...) and “Vanessa spaziert mit keinem ...” (Vanessa is walking with no ...), one might continue the affirmative with “Dackel” (a specific instance) but the negated version with “Hund” (a broader category), illustrating a potential shift toward abstraction. To examine whether negation systematically promotes abstraction, 100 adults with native or near-native proficiency in German participated in a two-choice sentence-matching experiment, where each trial presented an affirmed and a negated sentence beginning. Participants then selected for each sentence one of two possible completions differing in categorical level (concrete vs. abstract). A one-sample t-test revealed that negated beginnings were significantly more often associated with abstract endings. These findings suggest that negation extends beyond simple semantic inversion—it modulates the representational level of conceptual thought. This research advances our understanding of how linguistic structures, such as negation, influence cognitive abstraction and shape the way individuals mentally organize and interpret the world.

Keywords: linguistic negation, cognitive abstraction, construal level theory

A matter of orthography or familiarity? An eye-tracking study on the capital-I form and the gender star in German readers varying in age

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Gender-fair language in German aims to reduce the male bias induced by masculine generics. Some forms use capital letters (capital-I form: StudentIn – student) or special characters (gender star: Student*in) within role nouns. Concerns have been raised that such forms, which are not in line with German orthography, might impede the readability of texts. Previous studies found no decrease in subjective comprehensibility of texts (e.g., Friedrich et al. 2021, Pabst & Kollmayer 2023). Zacharski et al. (2025) reported initial lexical access difficulties for older nonstudents, but their design did not allow to differentiate whether these are due to orthography or factors like familiarity and age of acquisition. To address this, an eye-tracking study was conducted to compare the readability of texts using the capital-I form, which has been used since the 1980s, and the nowadays more frequently used gender star in a sample of 49 students ($M = 22.18$; $f: 24$, $m: 25$) and a group of older nonstudents (40-70 years; data collection in progress). Participants read 24 short newspaper articles with four tokens of a stereotypically neutral plural role noun in either star, capital-I, or masculine form (counterbalanced), and 8 filler texts without any inflectable role nouns. Surprisingly, for students, analysis of first pass and total reading times as well as total fixation counts revealed reduced reading times but higher fixation counts for the star. Data analysis for the older sample will shed light on whether these effects are due to the form's salience or the students' familiarity with it.

Keywords: readability, eye-tracking, gender-fair language, gender star, capital-I form, age differences, familiarity

Partner-Adapted Language Balance: Interlocutor Effects on Cross-Language Activation in German-French Bilinguals

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Bilingual language activation is generally non-selective, allowing both languages to be active simultaneously and creating the potential for cross-language interference. The present study examined whether the language background of a conversation partner influences the degree of cross-language interference experienced by German-French bilingual speakers. Scaling up a picture-word interference task to a social interaction between participants and confederate conversation partners, this study tested whether interacting with a bilingual partner, compared to a monolingual partner, increases L2 (French) interference and slows L1 (German) naming latencies. Preliminary results ($n = 8$) revealed an overall semantic interference effect, with slower responses for semantically related compared to unrelated trials. Consistent with our predictions, this semantic interference effect was larger with a bilingual than monolingual partner, as demonstrated by a promising, yet preliminary, marginally significant interaction effect. This modulation is what we refer to as partner-adapted language balance. Building on previous findings, we further examined whether participants with higher L2 proficiency would exhibit a more sensitive partner-adapted language balance. We found no significant effect of participants' L2 proficiency, although the data showed a slight numerical trend toward larger semantic interference effects for participants with higher L2 proficiency, consistent with our predicted direction. Taken together, our preliminary findings suggest that a partner's language background modulates cross-language activation, supporting the view that bilinguals flexibly adjust their situational language balance to match the current social context. These are interim results from the first eight participants; data collection will continue until the predetermined sample size ($N = 40$) is reached, to allow a robust evaluation of the effects.

Keywords: Bilingualism, Cross-language activation, Picture-word interference, Language Proficiency

Auditory distraction and self-reported autistic traits

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This poster presents a series of three preregistered experiments in which we replicated classic auditory distraction effects in young nonautistic adults and examined their relationship with self-reported autistic traits, which previously have been found to be associated with difficulties in auditory processing of natural speech and negative emotions. In Experiment 1, we replicated (1) the changing-state effect, which refers to an increased disruption by changing-state distractors relative to steady-state distractors, and (2) the auditory deviant effect, which refers to increased disruption of auditory deviant distractors relative to steady-state distractors. In Experiment 2, we replicated (3) the taboo effect which refers to increased disruption by irrelevant taboo words relative to irrelevant neutral words. In Experiment 3, we found (4) equivalent disruption by unintelligible and intelligible natural speech as is typically the case. In none of the experiments, however, we found evidence for an association between auditory distractibility and individual differences in self-reported autistic traits.

Keywords: auditory attention, auditory distraction, working memory

It looks like an evening sky! The aesthetic assessment of Old Chinese characters depends on the accuracy of their meaning interpretation

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The aesthetic appreciation of an object depends not only on its perceptual attributes, but also on the emotional context in which it is perceived and the cognitive processes associated with it. This study investigated whether guessing the meaning of Old Chinese characters correctly influenced aesthetic appreciation. In the first stage of the experiment, participants with no knowledge of Chinese were shown Old Chinese characters. In one condition they selected one meaning from two possible options for sixteen characters, then received feedback on the accuracy of their responses, and were shown the correct meaning (quiz condition). In a separate condition, participants were directly provided with the correct meanings of another sixteen characters (no quiz condition). In a second phase of the experiment, we measured how well participants had memorized the characters' meanings and collected ratings of how much they liked them. Participants recalled the meanings of characters they had guessed correctly better than those they had guessed incorrectly or those without a quiz. Additionally, success in guessing during the first phase influenced liking ratings in the second phase. Characters for which the meaning was guessed correctly were preferred to those for which it was guessed incorrectly, while the liking ratings of characters from the no quiz condition occupy a median position between these two conditions. These findings strengthen the idea that aesthetic appreciation of pictures or objects is influenced not only by their features, but also by cognitive interaction with them.

Keywords: empirical aesthetics, cognitive processing, meaning, liking, guessing, Old Chinese characters

Does Anxiety alter Visual Perception under Continuous Flash Suppression?

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Visual perception of external stimuli can be influenced by the internal state of the perceiver. This study investigates how threat anticipation modulates conscious visual perception using the breaking Continuous Flash Suppression (b-CFS) paradigm, a visual masking method that delays the access of stimuli to conscious awareness. In a within-subjects design, 40 participants undergo a threat-of-shock manipulation, inducing changes in internal state. Neutral faces are presented under b-CFS in both upright (ecologically meaningful) and inverted (not meaningful) orientation to determine whether threat differentially affects processing of higher-order stimulus properties. We assess how threat influences stimuli's access to awareness via Signal Detection Theory. Importantly, we separate detection ("Did you see something?") from discrimination ("Was the stimulus upright or inverted?") to differentiate responses often conflated in the b-CFS literature. Based on prior research, we hypothesize that threat will enhance perceptual sensitivity (d') and reduce reaction times. We further examine how face orientation modulates this effect, and whether detection and discrimination are differentially influenced by emotional state. Data collection is ongoing, and findings will be reported at the conference. This study aims to provide novel insights into the interplay between perceiver states and conscious visual perception, and it contributes a refined methodological approach to assessing perceptual awareness during b-CFS.

Keywords: Visual Perception, Perceiver State, Threat Anticipation, Breaking Continuous Flash Suppression, Signal Detection Theory, Face Inversion Effect

Defining Temporal and Methodological Parameters for Subliminal Priming in Touch

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Subliminal Priming is a phenomenon where a stimulus is presented below the threshold of conscious awareness, and sub-conscious primes influence the responses to later suprathreshold targets. Research in vision has established robust temporal windows for Positive Compatibility Effects (PCE) at short stimulus onset asynchronies (SOA) and Negative Compatibility Effects at longer SOAs (Eimer & Schlaghecken, 1998; Sumner, 2008), yet it is unknown whether and under what conditions does subliminal priming exists in touch. We ask what temporal window and what kind of stimuli are appropriate for tactile subliminal priming. We first implemented a masked prime-target paradigm with rhythmic vibrations delivered to the index fingers via two actuators. But we found the onset of rhythmic vibrations as subliminal primes required longer SOAs (>200 ms), compromising the priming effects, giving no reliable compatibility effects in reaction times or accuracy. Now we focus on single, brief primes that differ in carrier frequency (40 vs 240 Hz), targeting Meissner and Pacinian dominant channels respectively, combined with backward masking and SOAs below 180 ms. In a localization (left vs right) response-compatibility task, masked primes and clearly perceivable targets are mapped to motor responses (pedal presses), allowing to quantify frequency based PCE as a function of SOA. The project combines carefully calibrated individual thresholds for subliminal primes, where we found prime discrimination remained at chance level (50%), confirming that the primes were effectively subliminal. Ongoing study will identify frequency, masking, and SOA combinations that will allow us to investigate the research gap in tactile subliminal priming.

Keywords: Tactile Subliminal Priming, Positive Compatibility Effects, Stimulus Onset Asynchrony (SOA), Masked Priming, Vibrotactile Stimulation, Tactile Perception

When Repetition Fails to Increase Perceived Truth: Testing a Decision-Inertia and Skepticism Account

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The truth effect is the stable tendency to rate repeated statements as being more truthful than novel statements. Widespread theoretical explanations for this finding are the subjective feeling of familiarity or fluency or the activation of referential networks that increase with repetition and presumably inform truth judgements. Only one alteration in the classic truth effect paradigm has been able to reliably prevent the effect, which is the rating of validity instead of interest (or other shallow processing instructions) at the initial presentation of the statements. In fact, some studies even find a negative effect under these encoding conditions. Two theoretical accounts exist to explain this finding. Here we tested the first account, that rests on the following assumptions: if people are able to recall their initial statement rating, they will show decision inertia, i.e. they will stick to the initial rating. If they fail to recall their rating, but assume that they have encountered the statement before in the experiment, they will discount fluency as the experimental setting induces skepticism. To test these predictions, we experimentally manipulated decision inertia and skepticism to disentangle the different processes. Our results showed a negative main effect of repetition across all experimental conditions. Although decision inertia was generally present, the negative truth effect remained unexplained. In upcoming research, we aim to test the second theoretical approach, claiming that the activation of prior knowledge by the initial truth ratings can account for the elimination or reversal of the truth effect, respectively.

Keywords: truth effect, fluency, decision inertia, skepticism, MPT modelling

What blind spot? One-eyed individuals are overconfident of missing visual information.

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The visual gaps created by the retinal blindspots are normally irrelevant since corresponding information from the other eye is available, but even during monocular viewing the gaps are filled in by the brain. Since individuals without binocular vision (e.g., amblyopia, strabismus, monocular) have more day-to-day experience with filled-in information, they might be better at recognizing it as unreliable, and therefore have less confidence in it. Alternatively, they might have more confidence in it because filling-in might work better than in normal-sighted individuals. Here, we tested confidence in filling-in of the blindspot using grating stimuli with or without an orthogonal central portion that was smaller than the blindspot. These stimuli were shown monocularly either at the blindspot or at the corresponding location on the opposite side of the visual field. Normal-sighted and non-binocular individuals first had to judge which of two consecutive stimuli to rate (confidence task), then rate whether the chosen stimulus had a central portion or not (perception task). Overall, non-binocular individuals seemed to experience perceptual filling-in as robustly as normal-sighted individuals. However, the non-binocular individuals were more likely to trust the filled-information in their blindspot. Control experiments verified that this was not due to differences in perceived distortions between the tested locations. The results suggest a stronger reliance on filling-in mechanisms when alternative information from the other eye is not available.

Keywords: Perceptual completion, Blind spot, Metacognition, Visual confidence

Metacognition of fixation and incubation effect in problem-solving tasks

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Problem-solving tasks are a common experience; however, problem solving can be impeded by fixation. This mental blockade arises when previously successful strategies are applied incorrectly to the new problem. Prior solutions can block finding correct solutions for the current cognitive task. In contrast, after a break from active problem solving (a so-called period of incubation), people sometimes experience sudden insights, referred to as incubation effects. The context-dependent fixation hypothesis (Smith & Beda, 2020) proposes that fixation occurs because previous incorrect solutions become associated with the contextual cues. As long as the context remains unchanged, fixation occurs; when context is new, fixation may be overcome. This project examines metacognitive monitoring and control of these processes—whether individuals can recognise when fixation occurs and strategically regulate their behaviour to overcome fixation. In our study, we will adapt Smith and Beda's paradigm using the Remote Associates Test (RAT). The presence of fixation will be manipulated by presenting RAT problems on background contexts associated previously (or not) with incorrect solutions to those problems. We will be interested in metacognition of fixation, using measures such as Final Judgement of Solvability (fJOS) of RAT problems and decisions whether to attempt solving previously unsolved problems again. We hypothesize that participants will correctly attribute test failures to fixation. It should lead to higher fJOS and more frequent reattempt decisions in the fixation condition. This research aims to elucidate how people monitor and control their own problem solving, offering insight into the metacognitive mechanisms that might help overcome fixation.

Keywords: problem solving, metacognition, fixation, incubation effect, context, RAT

Geometric Regularities Improve Visual Working Memory Precision

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Working memory is highly limited in its capacity. This limitation constrains how precisely we remember visual content. Integrating multiple items into chunks of information provides a way to improve memory precision. While chunking is well-established in other working memory domains, its role in visual working memory remains unclear. We tested whether people organize visual memories using geometric primitives (e.g., recognizing two horizontally-oriented gratings as forming a "line"). We reanalyzed data from two whole-report working memory experiments including ~21,000 trials. Participants memorized either 2 or 4 orientations of simultaneously presented Gabor gratings. After a short delay, they reproduced each Gabor's orientation sequentially and rated their memory confidence. Importantly, each of the to-be-memorized Gabor orientations were randomly selected and presented at one out of six possible positions placed on a circular array around fixation per trial. We quantified how closely the arrangement of Gabors in a trial matched predefined primitives based on geometric properties like symmetry or parallelism. Participants showed greater precision and confidence when Gabor arrangements resembled geometric primitives compared to non-structured arrangements. This benefit was replicated across experiments, independent of report order, and consistent across various similarity thresholds. Interestingly, simpler geometric primitives were associated with better memory precision.

These findings establish that geometric integration operates spontaneously in visuospatial working memory, suggesting hierarchical principles of memory organization that leverage regularity to overcome capacity limitations.

Keywords: working memory, spatial memory, chunking, capacity limitation

Learning From Errors - Searching for the Neurocognitive Mechanisms Underlying Verbatim Trace Formation

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Episodic remembering is highly susceptible to distortion and errors. One prominent explanation is the overuse of gist instead of verbatim memory traces. Verbatim traces preserve the surface form of original information, enabling accurate discrimination between previously encountered and novel, yet highly similar information. In contrast, gist traces hold conceptual information. The neurocognitive mechanisms underlying verbatim trace formation are largely unknown. In the current study, we address this issue by using event-related potential (ERP) measures of successful memory formation.

Participants studied lists of arbitrary word pairs, for example Ebb – Pepper, Flood – Basil... Word pairs within a list shared a common theme, e.g., tides – spices. To vary the demands on verbatim trace formation, we manipulated the typicality of the word pairs within the list theme (high vs. low). In the memory test, participants had to discriminate between highly similar distractor pairs (Ebb – Basil) and previously encountered word pairs (Ebb – Pepper), which could only be achieved by using verbatim memory traces.

Against our expectations, the typicality manipulation neither affected memory performance for highly similar distractors, nor the respective ERP effects. However, replicating the findings from Cheng and Rugg (2010, *Int. J. Psychophysiol.*) we found an ERP correlate of successful memory formation at parietal recordings. Contrary to their findings, we observed a frontopolar instead of a parietal ERP effect associated with verbatim trace formation, which emerged exclusively in participants with high verbatim memory performance. Based on its spatiotemporal characteristics, it likely reflects inter-item binding supporting successful verbatim memory formation.

Keywords: Verbatim memory formation, Subsequent Memory Effects, Event-related Potentials, Memory

Active removal of distraction from working memory hypothesis

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Working memory (WM) is a cognitive system that temporarily maintains information needed for reasoning, learning, and comprehension, even under distraction. Because WM has limited capacity, interference-based models such as the SOB-CS model propose that forgetting occurs when new information—like automatically processed distractors—overwrites existing representations. To explain why distraction does not fully erase WM contents, SOB-CS assumes that distractors, although automatically encoded, are then actively removed from the short-term store. This removal process is time-dependent: with more free time available, removal becomes more efficient. Thus, longer intervals after distraction should improve memory when interference is harmful. However, when interference strengthens representations, more opportunities for removal should reduce distraction-related benefits. Our experiments tested whether the previously observed benefit of semantically related distraction—found in both short-term and long-term memory—would diminish when more time for distraction removal is available. In two experiments using a complex-span task, we manipulated (a) whether distractors were semantically related to the targets (related vs. unrelated) and (b) the duration of the unfilled interval following each distractor (100 vs. 1400 ms). In Experiment 1, related distractors were exemplars from the same broad semantic category. In Experiment 2, they were related through non-categorical semantic associations. We predicted that semantically related distractors would enhance performance, reflecting beneficial interference, but that this benefit would be smaller with longer post-distractor intervals, due to distraction being more successfully removed. Our results help determine whether distraction is automatically removed from WM, and with it not only its costs but also its benefits.

Keywords: Working Memory, Semantic Relatedness Effect, Distraction, Interference

Are you giving me a side-eye? Context-dependent effects of dynamic gaze patterns on social evaluations

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How people evaluate others' gaze in social interactions depends not only on specific gaze directions (e.g., more positive evaluation of downward averted gaze compared to other gaze aversions) but also on the context in which the gaze patterns occur (e.g., in negative contexts, the preference for direct gaze compared to downward averted gaze is diminished). In a series of four experiments employing the 'Video-Call Paradigm', we wanted to further investigate the gaze-context interplay including more natural, nuanced and dynamic gaze patterns. During the task, participants watched pre-recorded video clips displaying a dyadic conversation, in which one partner was listening to a short personal narration of another person (not visible, but audible). After each clip, participants rated the listener on relevant dimensions for social perception (e.g., empathy). The independent variable, gaze direction of the listener, was manipulated within subjects and was either static-direct or switched dynamically between direct (5 sec. interval) and downwards, sideways or upwards averted gaze (2 sec. interval). Second, emotional context was manipulated between subjects in that narrations varied comparing neutral with either sad (Exp.1), fearful (Exp.2), happy (Exp.3), or embarrassing (Exp. 4) narrations. Results suggest that listeners were differentially evaluated depending on their gaze direction and emotional context. For example, downward gaze was evaluated more positively, especially in sad contexts, while upward averted gaze was perceived as less favorable, especially in contexts of negative valence. Overall, the current studies demonstrate how different gaze patterns affect the perception and evaluation of individuals within emotional contexts.

Keywords: gaze patterns, gaze-context interplay, social evaluation, Video-Call Paradigm

The Impact of Human vs. AI Advisor on Sustainable Behaviour

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As algorithmic systems increasingly provide expert advice in various domains, questions arise about how audiences perceive such advice in terms of trustworthiness, credibility, and empathy. This study investigates how these perceptions are influenced by the source label (male expert, female expert, or AI system) and the communication style (neutral vs. empathic). Using a between-subjects experimental design, participants read a short advisory text concerning either sustainable pet ownership or sustainable investing. The content of the advice remained identical across all conditions; only the tone and attributed source label were systematically varied. After reading the text, participants evaluated the advisor on perceived trustworthiness, empathy, and credibility and indicated their intention to adopt more sustainable behaviours. Preliminary analyses examine how the combination of source identity and communication style shapes audience perceptions of expertise and reliability. The study further explores whether empathic language can mitigate potential biases toward certain sources, particularly AI-generated advice, and whether effects differ across topic domains or author gender labels. The study's findings shed light on how subtle linguistic and contextual factors influence the reception of expert advice and how that affects their willingness to adopt sustainable practices. Insights from this research can inform the design of responsible and trustworthy communication strategies in both human and AI-mediated contexts, particularly for promoting engagement and behavioural change in sustainability-related decisions. More broadly, the study contributes to ongoing discussions about trust in expert systems and the ethical implications of presenting AI as a credible and empathetic advisor.

Keywords: Empathic Communication, Source Credibility, AI Advice, Expert Trustworthiness, Sustainable Behaviour

Level 1 Visual Perspective Taking: The impact of induced beliefs in human and robot avatars

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Contributing to the debate whether level 1 visual perspective taking (L1-VPT) is an implicit socially rooted process (mentalizing) or rather a non-social process (submentalizing), a laboratory study by Furlanetto et al. (2016) showed evidence in favor of the mentalizing approach: Using the Dot Perspective Task (Samson et al., 2010), the authors found altercentric intrusions, when a top-down belief cover story asserted that an avatar was able to see, but not when the avatar's vision was presumably suspended. Altercentric intrusions have been considered indicative of spontaneous perspective taking, implying that observers cannot fully inhibit another agent's conflicting perspective. We aimed to test and transfer this finding to non-human avatars in two online experiments, each with a 2 (consistency vs. inconsistency of observer's and avatar's perspective) × 2 (self vs. other perspective) × 3 belief induction (seeing avatar without goggles; seeing avatar with transparent goggles; non-seeing avatar with opaque goggles). Experiment 1 with a human avatar ($n = 86$) and Experiment 2 with a robot avatar ($n = 86$) both replicated the hypothesized altercentric intrusion effects for error rates, but not for response times. Egocentric intrusions, i.e., intrusions of the self-perspective when asked to take the avatar's perspective, however, were moderated by the belief induction, appearing only under the conditions with a seeing (human or robot) avatar. Addressing the generalizability of altercentric intrusion effects over human and robot avatars, we discuss whether this effect might represent a more explicit form of perspective taking based on submentalizing.

Keywords: visual perspective taking, Dot Perspective Task, implicit mentalizing, submentalizing, altercentric intrusion effects, robot avatars

An immersive virtual reality paradigm to investigate food-related inhibitory control

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Eating behavior results from the intricate interplay between homeostatic and several cognitive processes, including reward-driven (hedonic) factors and executive functions. Among the latter, inhibitory control seems to be particularly related to dysregulated eating behaviors. Inhibitory control refers to the late-stage ability to stop unwanted thoughts and actions. Longer stopping latencies and more frequent stopping errors have been associated with overweight and overeating. In contrast to this, enhanced inhibitory control may be present in patients with anorexia nervosa of the restrictive type. It is, however, not clear how inhibitory control unfolds in response to food stimuli in particular. Moreover, a methodological challenge is to quantify successful stopping to specific stimuli directly. To address these factors, a virtual reality paradigm was developed and tested empirically. Across a series of experimental studies, the immersive virtual reality paradigm was used to present three-dimensional food and control stimuli. Participants performed a stop-signal task that required them to stop an initiated reach movement, and their reach movements were continuously recorded to directly measure stopped behavior by movement trajectory indices. We investigated construct validity in a key-press stop-signal task, predictive validity in a bogus taste test, stimulus effects in participants with chocolate craving and in adolescents with anorexia nervosa. Theoretical implications that incorporate motivated behavior towards food and clinically relevant alterations of inhibitory control in a neurocognitive model of inhibitory control are discussed.

Keywords: inhibitory control, eating behavior, virtual reality

I know about you. Modulation of facial reactions and neural processing of faces by acquired attitudes.

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Regulating emotional facial expressions is crucial for successful social interaction, engaging both cognitive control and affective processing systems. The present research examined how acquired attitudes toward others influence the inhibition of affiliative facial expressions such as smiling. Across three studies, participants first acquired positive or negative attitudes toward target faces through an evaluative learning task and then completed facial expression and approach–avoidance measurements.

Behavioral and electromyographic (EMG) findings revealed that inhibiting affiliative expressions was more effective toward negatively valenced targets, whereas inhibition of disengaging expressions (e.g., frowning) was not modulated by target valence. During suppression trials, the zygomaticus major (ZM) muscle showed greater peak activation for positively valenced targets, reflecting increased congruent activity. Approach–avoidance measures further indicated an approach bias toward smiling targets associated with positive attitudes, but not toward smiling targets associated with negative attitudes.

A forth study employing EEG is currently being analyzed to examine neural correlates of this process. Specifically, we analyze conflict-related components (N2, ERN) and face processing indicators during a social Go/NoGo task to determine when emotional displays of disliked others are discounted and whether they elicit enhanced conflict. Together, these findings integrate theories of cognitive control and social–emotional conflict in the regulation of facial actions.

Keywords: attitude, face, eeg, inhibition, conflict

The Effect of Modal versus Amodal Implementation Intentions on Food-Related Inhibitory Control: A Stop-Signal Task Study

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Implementation intentions (if-then plans; Gollwitzer, 1999) improve self-control by automating goal-directed behavior. However, the effectiveness of these plans may depend critically on how they instruct individuals to mentally represent tempting stimuli. We investigate whether if-then plans using different mental representation strategies; modal (concrete, sensory) versus amodal (abstract, distant) have opposite effects on food-related inhibitory control. Based on Grounded Cognition Theory and Construal Level Theory, we predict that modal if-then plans instructing concrete sensory engagement will inadvertently strengthen food temptation, while amodal if-then plans instructing abstract psychological distancing will reduce temptation and facilitate inhibition. We will conduct a pre-registered randomized experiment ($N = 159$) with three conditions: (1) Control (no strategy), (2) Modal if-then plan: If I see a food image, then I will mentally bring it closer, look, smell, and imagine eating it, (3) Amodal if-then plan: If I see a food image, then I will mentally push it as far away as possible until it disappears from sight. Participants complete a Stop-Signal Task measuring response inhibition (SSRT) for high-calorie food and neutral images. Data collection is scheduled to begin November 2025 via Prolific and University of Tübingen participant pool. We predict amodal if-then plans will produce better inhibition than control, while modal if-then plans will produce worse inhibition, specifically for food stimuli.

Building on previous work demonstrating the effectiveness of implementation intentions for self-control, this research tests whether implementation intentions using amodal mental representations can serve as practical cognitive intervention tools for people with eating problems and eating disorders. Results will be fully analysed and available for presentation.

Keywords: implementation intentions, self-control, eating disorders, mental representations, cognitive interventions

Action-effect linkages in prevention actions

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The human action repertoire encompasses a wide range of behaviors. From a goal-centered perspective, these behaviors can be categorized into two complementary types of actions: production and prevention actions. While research on action control has traditionally focused on production actions, integrating prevention actions into existing theories is essential, as the two differ fundamentally in their goal structures: Production actions aim at the occurrence (i.e., presence) of observable events, whereas prevention actions aim at the non-occurrence (i.e., absence) of such events. This distinction raises the question of how mechanistic theories of action control can accommodate cognitive representations of prevention actions. In previous studies, I showed that, despite their structural differences, these action types are represented in surprisingly similar ways. Here, I aim to build on these findings and suggest that prevention actions can thus serve as a novel tool to address core questions in the field. I will present an experiment that tests whether qualitative information about a relation becomes integrated into the respective linkage. Based on these results, I will demonstrate how prevention actions can contribute to ongoing debates about associative and propositional mechanisms in ideomotor paradigms and binding.

Keywords: prevention actions, ideomotor framework, associations, propositions, binding

The emotional economics of dishonesty

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While a lot of research has investigated the cognitive mechanisms for lying, its associated affect is often overlooked. Here, we show that honesty and dishonesty cause short-lived, transient affect: honesty triggers relatively more positive affect compared to dishonesty. To investigate this, participants first performed several specific activities. After that, they had to answer questions regarding these (and other) activities in a computerized affective priming paradigm. This required participants to first respond honestly or dishonestly to simple yes/no Prime questions, and afterwards to categorize positive or negative Probe words. Results show that participants were slower and more error prone when lying compared to responding honestly in the Prime task, replicating previous findings that it is cognitively more demanding to lie than to tell the truth. Most importantly, we found that telling the truth sensitizes for subsequent positive stimuli, and it does more so than lying. Further, emotional habituation seems to take place, lessening the overall affective evaluation of self-produced actions over time. We discuss the functional role that affect may play in the generation and production of dishonesty-based behavior in the framework of action control.

Keywords: honesty; dishonesty; affect; priming; action control

Impact of the Aspiration Level in Exploration Scenarios

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A key factor influencing how much people explore is their aspiration level. The aspiration level is often thought to be determined by state affordances as well as by a person's trait tendency to satisfice or maximize. The present study aims to shed light on how state and trait aspiration levels shape exploratory behavior. Participants completed a multi-armed bandit task in which their state aspiration level was manipulated: in every round, they received the same instruction about how many points they needed to achieve a good result, while the environment was either scarce, rich, or medium. This manipulation resulted in an easy task (low state aspiration level), a hard task (high state aspiration level), and a medium task. The tendency to maximize or satisfice was assessed via self-report. Participants switched significantly more when their state aspiration level was high, and performed best when their state aspiration level was medium. Computational modeling using reinforcement learning revealed that these changes in switching behavior were due to changes in exploration strategy. These findings align with the predictions of risk sensitivity theory as well as with the notion of aspiration levels as stopping rules. However, contrary to our expectations, the trait tendency to maximize or satisfice was not related to switching behavior, nor to changes in switching between conditions. Overall, the results highlight the importance of state affordances over trait tendencies.

Keywords: Exploration, decisions under uncertainty, reinforcement learning, aspiration

Implicit task structure guides multi-attribute decision making in naturalistic contexts

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Humans are constantly facing decisions that need to be made quickly without access to complete information. Yet, despite the complexity of naturalistic decision problems, most classical decision-making studies rely on artificial settings that might fail to capture these real life demands. To address this issue, we conducted a multi-attribute decision making study to understand human decision making strategies in everyday problems. Large language models were used to generate naturalistic problems under two conditions: one where the order of feature importance was known (ranking condition) and one where the direction of correlation with the outcome was known (direction condition). Participants ($N = 123$) were not informed about the condition they were assigned to and randomly placed into groups. We compared three computational models (weighted additive, equal weighting, single cue) across three binarization strategies (none, relative, absolute threshold). Model comparison revealed that in the ranking condition, the single cue model characterized human decisions the best, indicating that participants made decisions by focusing on one dominant cue. In contrast, in the direction condition, the equal weighting model dominated, indicating that participants attributed equal importance to both cues. In addition, models without binarization explained the observed behavior best in both conditions. This means participants processed cue values as continuous quantities rather than mentally categorizing them as “high” or “low”. Taken together, these findings imply that human decision strategies are flexible and adapt to task demands, offering new insights into decision-making in naturalistic contexts.

Keywords: heuristics, decision making, cognitive modelling, ecological validity, large language models

Temporal Source Memory Modulation by Discrete Negative Emotions and Retention Interval: An Experimental Study Using Emotional Facial Stimuli

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The planned study investigates how discrete negative emotions, specifically fear and anger, modulate temporal source memory across different retention intervals. While previous research has demonstrated that emotional arousal and valence influence item recognition and memory for perceptual contexts or sources, the interaction between emotion and the temporal organization of episodic memory remains underexplored. Fear and anger, although both threat-related, negatively valenced, and high in arousal, differ in their attentional orientations: fear tends to broaden attention toward contextual cues, whereas anger orients attention toward the source of threat. This divergence may differentially influence how emotional events are temporally bound and later retrieved.

In the experiment, participants will view two sequential face lists composed of fearful, angry, and neutral facial expressions presented in randomized order. Retention interval will be manipulated between subjects as immediate and 24-hour delayed test. Following encoding, participants will complete a recognition test for the faces and temporal source attribution test for their list membership. We are seeking input on an affective rating tool to ensure and assess active appraisal of the emotional stimuli. Memory data will be modeled using the two-high-threshold multinomial processing tree (2HTM) model (Bayen et al., 1996) to disentangle item recognition, source memory, and guessing behavior. This approach enables a fine-grained understanding of how discrete emotions shape temporal binding across different memory delays, making an important contribution to emotion and cognition research.

Keywords: temporal memory, source memory, fear, anger, emotion–cognition interaction, retention interval, memory modeling

Modulating Verbal Working Memory Capacity through Theta-tACS: Evidence from the Running Span Task

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Cognitive enhancement through non-invasive brain stimulation has gained increasing attention, yet findings remain heterogeneous and often inconsistent. A key challenge is to disentangle genuine stimulation effects from practice or placebo-related improvements.

The present study investigates whether transcranial alternating current stimulation (tACS) in the individual theta range (4–7 Hz) enhances verbal working memory capacity. We employ a single-blind, within-subjects crossover design ($N = 20$) using the Running Span Task, a demanding paradigm shown to be largely resistant to unspecific training effects. Individual theta frequency is estimated from resting-state EEG, and participants complete active and control sessions while performing the task before and during stimulation.

Building on theoretical accounts linking slower theta oscillations to greater working-memory capacity via more efficient theta–gamma coupling, we test whether frontoparietal theta-tACS can improve verbal maintenance performance. Data collection is ongoing; preliminary results and implications for models of neural oscillatory mechanisms in working memory will be discussed.

Keywords: working memory, cognitive enhancement, tACS

A matter of encoding? – How reward salient sounds interfere with visual working memory

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Stimuli that have led to a positive outcome (a reward) in previous encounters draw attention resulting in enhanced processing. This has been shown to generalize to new contexts in which no reward is given in both perception and working memory (WM). However, these experiments usually consider only one modality at a time. This unimodal approach does not do justice to the sensory complexity of natural environments. Pooresmaeli et al. (2014) addressed this gap by demonstrating a cross-modal value-driven enhancement of visual processing by the presentation of reward salient auditory stimuli. This MEG study investigates cross-modal value-driven effects in WM. Participants performed interleaved blocks of two tasks: In a sounds localization task, participants learned to associate two sounds with a high and low reward, respectively. In a WM task, they compared a memorized orientation to the orientation of a probe stimulus. Critically, the sounds, albeit task-irrelevant, were concurrently presented during encoding or maintenance, allowing us to assess which WM subprocess might be susceptible to value-driven interference. Contrary to our hypothesis, we observed lower accuracy when high compared to low reward salient sounds were presented during encoding. There was no value driven effect of sounds presented during memory maintenance. Thus, WM encoding seems to be more susceptible to cross-modal value-driven interference than maintenance. Ongoing MEG analyses will give further insights on cross-modal value-driven effects on representational strength of WM content and attentional selection during encoding and maintenance.

Keywords: working memory, attention, reward, MEG, crossmodal

The Impact of Other People's Memory Performance on Metamemory Monitoring During Learning

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Information about other people's performance in a memory task can indicate how difficult the studied material is. We examined how such external cues influence confidence during learning of word pairs and whether these cues operate similarly to materials-based cues – those that objectively affect the difficulty of study materials (word relatedness) and those that merely make the materials appear more difficult (font alteration). Altogether, we conducted six experiments. In four experiments, the pairs were either related or unrelated; in two experiments, they appeared either in an ordinary or an altered font. In all experiments, after seeing each pair participants received information ostensibly reflecting the performance of a yoked participant: that this person had recalled the word, had failed to recall it, or had not seen it. They then made immediate judgments of learning (JOLs), estimating whether they would later recall the second word when cued with the first. JOLs were framed either in terms of remembering or forgetting (three experiments each). The experiments used either a 5-point scale or a binary yes/no response. This ensured that the findings were not tied to a specific response format or phrasing. As expected, participants were more confident about recalling related than unrelated pairs in the cued-recall test. Their JOLs were also higher when they were told that another participant had recalled the pair, compared with the “did not see it” condition, but negative information – that the other participant failed to recall it – had no effect. Data collection for the font-alteration experiments is ongoing.

Keywords: judgments of learning, metamemory, associative learning, cued recall

Chatbots as Simulated Patients for Psychotherapy Training

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Through the success of chatGPT, chatbots have become increasingly available as a tool in psychotherapy. While most research focusses on the feasibility of using chatbots as therapists, we take a different approach by using chatGPT to simulate patients for psychotherapy training. We ground our chatbot design in two frameworks of therapist-patient interactions: The rupture-repair model and Kiesler's interpersonal circumplex model. The rupture-repair model characterizes therapist-patient interactions as a cycle of breakdowns of the relationship (rupture) and the subsequent restauration of trust and collaboration (repair). Kiesler's interpersonal circumplex model characterizes these interactions along two orthogonal dimensions: dominance-submissiveness and acceptance-rejection. Since the therapeutic alliance is one of the key factors in therapy success, it is important to incorporate hands-on practice into psychotherapy training. We propose that this can be practiced using chatbots that are prompted to correspond to different interpersonal profiles of the Kiesler model in order to create challenging therapy scenarios. Here, we present a proof-of-concept study in which we train human simulated patients and chatGPT in the same patient script. We then ask psychotherapists in training to interact with human simulated patients in a teletherapy setting. Unbeknownst to them, in half the cases the human simulated patients simply read out chatGPT responses. We use questionnaires and interviews to identify rupture-repair processes, to evaluate whether the intended interpersonal position according to the Kiesler model was achieved, and to compare the quality of the chatGPT simulated patient with the human simulated patient.

Keywords: psychotherapy, artificial intelligence, chatbots, human-chatbot interaction, therapeutic alliance

A Short-Term Challenge, a Long-Term Lesson: Living with Gestational Diabetes

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Gestational diabetes mellitus (GDM) poses distinct psychosocial challenges that differ from other types of diabetes due to its sudden onset and transient nature. The condition may lead to several complications for both the mother and the fetus, thereby amplifying the inherent stressors of pregnancy. These increased demands and the necessity for heightened self-regulation place a substantial psychological burden on expectant mothers, influencing their emotional well-being and daily functioning. The present study aimed to explore the subjective experience of diabetes-related distress among women diagnosed with GDM. Specifically, it examined how health empowerment, motivation for healthy eating, body responsiveness, and meaning in life predict different facets of diabetes distress within this population. A total of 124 women with GDM ($M_{age} = 31.4$, $SD = 4.39$, 21 – 42 years) completed an online self-report questionnaire. Results indicated that Emotional Burden was the most pronounced among the four dimensions of diabetes distress. Body responsiveness and health empowerment emerged as the strongest predictors across all facets, with higher levels of both associated with lower distress. Introjected regulation for healthy eating increased Regimen Distress, whereas amotivation exacerbated Interpersonal Distress and external regulation mitigated it. Meaning in life did not contribute significantly to any of the predictive models. The lived experience of GDM is characterized by elevated emotional vulnerability and complex behavioral demands. Enhancing autonomy, intrinsic motivation, and body responsiveness may reduce diabetes distress and improve psychological adaptation during pregnancy.

Keywords: gestational diabetes mellitus, diabetes distress, health empowerment, motivation for healthy eating, body responsiveness, meaning in life

Heart Rate and EEG Synchrony in Patients with Major Depressive Disorder During a Mindfulness Based Intervention

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Interpersonal synchrony is regarded as a key mechanism in social coordination and emotional co-regulation. In psychotherapy research, synchrony between therapist and patient has been shown to be associated with a stronger alliance and better treatment outcomes. However, psychotherapy frequently takes place in group settings in which patients engage and practice together, raising the question of whether synchrony also emerges between patients, under what conditions it occurs, and whether it relates to therapeutic progress. In this study, we investigate dyadic physiological synchrony in patients with depression participating in a mindfulness-based intervention. Using a hyperscanning approach, we simultaneously recorded electroencephalogram (EEG) and electrocardiogram (ECG) from two interacting patients. We present preliminary results and demonstrate the feasibility of this innovative hyperscanning setup, which allows for naturalistic patient-to-patient interaction during a structured therapeutic exercise. The study addresses a markedly under-explored field and provides new insights into how mindfulness-based dyadic interventions may contribute to treatment outcomes in group psychotherapy.

Keywords: EEG, hyperscanning, depression, synchrony, psychotherapy

Virtual Reality Hand Posture Eliminates the Crossed-Hands Deficit in Tactile Localization

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The integration of somatotopic and external spatial representations is fundamental for localizing tactile stimuli. When the hands are crossed, tactile temporal order judgments (TOJ) are typically impaired, reflecting a conflict between anatomical and external reference frames. Prior research demonstrates that this crossed-hands deficit can be modulated by visual information about limb posture, provided this information is embodied and temporally coupled with the observer's own movements. In the present virtual reality study, participants performed tactile TOJ tasks under four conditions that independently manipulated real arm posture (crossed vs. uncrossed) and the posture of a pair of visuomotor-correlated virtual arms and hands (crossed vs. uncrossed). Replicating classic findings, the crossed-hands posture led to a robust deficit when visual input matched this configuration. Critically, however, the deficit was completely abolished when participants viewed uncrossed virtual limbs that moved in temporal synchrony with their real movements, despite their actual posture being crossed. Conversely, uncrossed arms showed a marked impairment when paired with crossed virtual limbs, approaching the magnitude of the classic crossed-hands deficit. These results demonstrate that visuomotor embodiment of limb posture can override proprioceptive signals in tactile remapping. The findings indicate that the brain flexibly prioritizes visual body configuration when establishing spatial coordinates for touch, and that this weighting is sufficient to fully realign tactile perception even under somatically conflicting conditions.

Keywords: Crossed-hands deficit, Tactile perception, Multisensory integration, Virtual reality, Visuomotor coupling, Spatial remapping, Body representation

Smells Like a Good Deal? Scent-Product Congruence Disproportionately Regulates Anchoring Adjustments

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The anchoring effect is a well-described phenomenon biasing participants' numerical response towards the anchor, creating an abundance of opportunities to influence purchasing behavior (e.g., Epley & Gilovich. 2006). Given that scents also influence consumer perception (e.g., Mattila & Wirtz 2001), here we asked in how far anchoring interacts with scent congruency in a simulated negotiation paradigm relating to four food categories in a fictitious farmer's market scenario. Specifically, we used the concept of the anchor zone to create an expected outcome range with an original price and a lower limit negotiation price. We kept original prices constant over the conditions while varying lower limits in two steps (large vs. small anchor zones), hence creating either more or less room for negotiation. In parallel, we manipulated scent-food congruency using a four-channel olfactometer. In a computer-based laboratory experiment, 47 participants evaluated 80 product-scent combinations and estimated the final negotiation price that they expected to agree upon with the seller. Our findings reveal significant main effects with both congruent scents as well as narrow anchor zones generating higher price estimates. Furthermore, scent congruence and lower limit of the anchor zone interact overadditively: The low negotiation outcome price of incongruent scents is particularly pronounced when co-presented with broad anchor zones. These findings demonstrate that multisensorial stimulation, precisely olfactory cues in combination with price anchors, has a pronounced effect on economic valuations. Regarding the underlying mechanism, we speculate that transaction utility increases with scent congruency and perceived negotiation success.

Keywords: Anchoring, multimodal perception, multisensory perception, behavioral economics, consumer psychology, olfaction, numerical processing

Beyond the Regression Effect: Investigating Cross-Modal PSEs in Brightness and Loudness Perception

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This exploratory study investigates the impact of eliminating role-based influences on cross-modal points of subjective equality (PSE) in brightness and loudness perception. The traditional magnitude production paradigm creates asymmetry in stimulus roles, linked to a regression effect wherein adjustments gravitate toward the mean of the stimulus range. A two-alternative forced choice paradigm with an adaptive staircase procedure was employed to obscure intensity adjustments and neutralize stimulus roles, aiming to experimentally manipulate the internal references posited by the theory of global psychophysics (Luce et al., 2010). This enables a focused investigation of the intensity-matching's cognitive representation within the theory. Cross-modal PSEs for fixed auditory and visual standards were assessed through paired comparison trials, with each standard repeatedly paired with various comparison intensities from the alternate modality. The resulting cross-modal PSEs were estimated at the individual level using a binomial mixture model (Kuss et al., 2005; Schütt et al., 2016). These estimates informed the global psychophysics model under the assumption of role-independent reference intensities (Heller, 2021). The results revealed a mixed pattern across the six subjects. We discuss the implications of the absence of a regression effect in cross-modal PSEs for the cognitive representations involved in intensity-matching judgments. This study contributes to the understanding of cognitive processes in cross-modal perception and the implications of eliminating stimulus role dependencies in psychophysical judgments.

Keywords: adaptive 2AFC, cross-modal, regression effect, global psychophysics, Bayesian estimation

The Positive Type B Effect as a Procedural Artefact from Biased Staircases

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In psychophysical discrimination tasks, sensitivity often varies with the order in which a constant standard and a variable comparison is presented, a finding referred to as Type-B-Effect. Typically, difference limens are lower when the standard is presented before the comparison than when this order is reversed. This direction of the Type-B-Effect is defined as negative, while the opposite direction (higher difference limens when the standard precedes the comparison) is defined as positive. The negative Type-B-Effect is predicted by the internal reference model (IRM), which assumes that the second stimulus is judged relative to an internal standard that is updated on each trial. Challenging this model, positive Type-B-Effects have been reported repeatedly for duration discrimination experiments. Noteworthy, these experiments share the design choice of combining staircase procedures with very short standard durations. Here, we present simulations showing that measuring sensitivity under these boundary conditions may be biased. In detail, the procedure can asymmetrically inflate difference limens, in consequence leading to the appearance of a positive Type-B-Effect. In addition, data from two duration discrimination experiments show no positive Type-B-Effect when the method of constant stimuli is used, even with stimulus configurations closely matching those of earlier reports.

Taken together, our results suggest that previously reported positive Type-B-Effects do not provide convincing evidence against IRM. Rather, we suspect that positive Type-B-Effects arise as a procedural artifact from a specific combination of design choices.

Keywords: Psychophysics, Stimulus Discrimination, Internal Reference, Adaptive Staircases, Type B Effect, Order Effects

An Application of Established Computational Models of Estimation in Three Real-World Domains

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Research on quantitative estimation often relies either on formal computational models tested with simplified laboratory stimuli or on informal theories applied to real-world tasks. The present study connects these approaches by testing established computational models with 80 real-world stimuli from three domains: food, countries, and mammals. A total of $N = 142$ participants were trained to estimate one of three domain-specific continuous criteria (carbohydrates per 100g for foods, life expectancy for countries, days to female maturity for mammals) and then judged new items in a test phase. We compared five candidate models (the Cue Abstraction Model, the Generalized Context Model, the RuEx-J hybrid, the Mapping Model, and the QuickEst heuristic) in their ability to account for participants' estimates in these domains using a simulation-based Bayesian model comparison. All models except QuickEst accounted for participants' estimates, although the dominant cognitive processes differed across domains. These findings reveal domain-specific variation in estimation strategies and demonstrate that computational models originally developed for artificial tasks can also capture judgments in naturalistic settings. Overall, the results highlight the importance of testing cognitive process models beyond controlled laboratory contexts to better understand real-world quantitative estimation.

Keywords: quantitative estimation, quantitative judgment, multidimensional scaling, cognitive modeling

Does Optional Stopping Lead to Higher Error Rates than Fixed-N Designs in the Bayesian t-Test?

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Optional stopping is the practice of stopping data collection as soon as the data is decisive enough. This can be beneficial when samples are costly. While standard frequentist tests lose their error rate guarantees under optional stopping, Bayesians typically argue that optional stopping presents no problem for them. However, Sanborn & Hills (2014, *Psychonomic Bulletin & Review*) demonstrated that optional stopping does have implications on error rates for typical Bayesian tests, too. Because their analysis was restricted to optional stopping for only one decision boundary (H1), we consider the more realistic case of optional stopping for two decision boundaries (H0 and H1): We compare error rates of the Bayesian t-test using either optional stopping or fixed-N designs across different effect sizes. For fixed-N designs we use three variants of how to determine the sample size: (1) Selecting N that maximizes decisions for H1 (MAX), (2) selecting N as the average length of optional stopping (STOP AVG), and (3) selecting N according to the whole distribution of optional stopping lengths (SAME DIST). Interestingly, we find that for very small effect sizes, the type 2 error rate of MAX is higher than with optional stopping, while for larger effects, the type 2 error rate of MAX, STOP AVG and SAME DIST is lower than with optional stopping. This suggests that the relationship between optional stopping and fixed-N designs regarding error rates in the Bayesian t-test is more nuanced than typically thought.

Keywords: Optional Stopping, Sequential Testing, Bayesian, Bayesian t-test, Bayes factor, Error rates, Hypothesis testing

„Career Despite Ethnic Background?": A Quantitative Study Based on the Social Cognitive Career Theory

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This study investigates how subjectively experienced migration-related influences shape the career goal orientations of Generation Z. Subjective migration identity is conceptualized through perceived adaptation pressure and visible social marking. This approach contrasts with the administrative definition used by the German Federal Statistical Office, according to which an individual is classified as having a migration background if they themselves, or at least one parent, were not born with German citizenship. This binary classification does not capture individual experiences of belonging and difference, yet it continues to be widely applied in research. Social Cognitive Career Theory and the Career Anchor Model provided the theoretical framework for understanding career goal orientation. Data were collected through a cross-sectional, correlational online survey ($N = 194$). Serial mediation analyses examined multidimensional relationships between subjective migration expression (predictor), professional learning experiences and professional self-efficacy experience (mediators), and various career anchors (criteria). Contrary to expectations, individuals with stronger subjective migration-related imprinting report fewer positive career-related learning experiences, but higher career self-efficacy. Career self-efficacy emerged as a central psychological resource through which subjective migration-related imprinting influences several career anchors. Positive direct and/or indirect associations were found particularly for the anchors Autonomy, Entrepreneurial Creativity, Challenge, General Management, and Technical/Functional Competence. Some models indicated suppressor effects, suggesting that indirect pathways can attenuate total effects. These findings highlight the importance of migration-sensitive career guidance and illustrate that integrating Social Cognitive Career Theory with the Career Anchor model provides a nuanced framework for understanding career development among young adults shaped by migration.

Keywords: online survey, subjective migration identity, Social Cognitive Career Theory, Career Anchor Model, career goal orientation, self-efficacy, Generation Z

Interactive Climate Museum: Evidence of Interactivity, not Presentation Mode Influencing Willingness to Act

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The climate museum is an interactive virtual learning environment based on the En-ROADS climate solutions simulator and enhanced with dynamic 3D visualizations of a landscape depicting, amongst other elements, a coastal city and a forest. The environment further simulates the temporal evolution of the landscape over the next decades. We explored how such visualizations of climate simulations affect individuals' willingness to act on climate change. Participants explored the climate museum on a multi-touch table, engaged with climate policy simulations, received real-time feedback, and indicated their willingness to act on climate change. They were presented with the 2D dashboard of the En-ROADS climate solutions simulator or with the additional immersive 3D simulations. We found that participants' willingness to act on climate change increased significantly during the simulation, accompanied by a high usage frequency of the simulator's sliders. However, contrary to our hypothesis, we found no interaction effect of presentation type on willingness to act. Participants exposed to the 3D simulations did not report higher willingness to act compared to those using the 2D dashboard. These findings suggest that interacting with the simulation per se might be more impactful for enhancing willingness to act than being exposed to immersive technology. We, thus, propose to explore further interactive features, such as agency, to gain further insights into how citizens explore the complexity of climate change.

Keywords: climate communication, interactive learning environments, climate simulation, immersive technology, willingness to act

Four-Arm Randomised Controlled Pilot of Virtual Reality Exposure - Anxiety Reduction and User Experience on Healthy Subjects

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Background: Virtual reality (VR) offers various benefits in anxiety reduction. The effect of active vs passive immersive environment, involved in this reduction is rarely investigated. This study aimed to investigate the effect of active and passive immersive virtual reality on anxiety reduction and user experience (UX) during the conditions.

Method: A double-blinded randomized controlled trial was conducted in September and October 2025. Fifty-eight healthy volunteers were randomly allocated to AFI (Active Fully Immersive, $N = 15$), API (Active Partially Immersive, $N = 15$), PFI (Passive Fully Immersive, $N = 14$) and PPI (Passive Partially Immersive, $N = 14$). Meta Quest 3 HMD (Head Mounted Display) with controllers were deployed for 5 minutes intervention. Heart rate (HR) and breathing rate (BR) were acquired using Zephyr wearable sensor, while STAI (State-Trait Anxiety Index), MPS (Multidimensional Presence Scale), SUS (System Usability Scale) and SSQ (Simulation Sickness Questionnaire) were obtained through Qualtrics. Result: All group showed reduction in anxiety state and cardiopulmonary rates. Significant STAI reductions were only evident in AFI ($p = 0.02$, $F = 0.39$) and PPI ($p = 0.015$, $F = 7.76$). Highest arousal of HR and BR was captured in high immersive groups (AFI and PFI). Similarly, high presence was found in AFI and PFI. While the lowest usability was reported in API, the same group reported the highest simulation sickness.

Discussion: VR might contribute to anxiety reduction. The synergy of immersion and interactivity levels in virtual environment play vital on user experience. Cognitive load and attentional bias should be taken into account. Future study should focus on populations with specific anxiety disorders.

Keywords: anxiety, pulse rate, respirational rate, user experience, virtual reality

Mental Representations Evoked by the Non-Binary Gender Colon in German – Insights from a Word-Picture Matching Task

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The use of gender-fair language (GFL) is intended to linguistically include persons of all genders. Over the last years, the gender colon has rapidly gained popularity in German (Waldendorf, 2024). It is similar to the gender star, but, instead of an asterisk, a colon is inserted between the masculine form/word stem and the feminine suffix -in (e.g., Student:in - student). The aim of both forms is to make persons identifying as nonbinary typographically visible. By now, several studies have investigated mental representations elicited by the star (e.g., Körner et al. 2022, Zacharski & Ferstl 2023). Until now, however, it was unclear whether the colon evoked the intended inclusive interpretation. In an online experiment, 108 students completed a word-picture matching task developed by Zacharski & Ferstl (2023). Participants saw singular role nouns in colon, feminine, or masculine form. After each word, they were presented with a picture of a person read as nonbinary, female, or male. They had to decide whether the image was a suitable visualization of the presented word. Replicating previous findings, masculine forms evoked a male bias in mental representations. Interestingly, this effect was particularly strong for participants who held a positive attitude towards GFL. This suggests an enhanced male-specific interpretation in persons with a higher sensitivity towards gender discrimination. The gender colon, in contrast, was more appropriate than the masculine as a gender-inclusive form. However, a slight female bias was found in acceptance rates. Future research is needed to replicate this finding in more diverse samples.

Keywords: mental representations, word-picture matching task, gender-fair language, nonbinary gender forms, gender colon, psycholinguistics

Meta-Analysis of Motor Compatibility Effects in Embodied Language Research

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Compatibility effect paradigms are an important behavioral method for investigating embodied accounts of language comprehension. The core assumption of these paradigms is that there is (in)compatibility between sensorimotor features of the linguistic stimuli and the action physically performed to make responses during the experiment. Key elements of embodied theories have been developed and probed using compatibility effect paradigms. Significant compatibility effects (faster and more accurate responses in compatible versus incompatible trials) have been found across various meaning dimensions (e.g., toward-away, clockwise-counterclockwise, precision-power grip, up-down), using diverse motor responses and linguistic stimuli (e.g., nouns, verbs, word pairs, and sentences). Although compatibility effect paradigms remain popular in the literature, a growing body of literature has questioned whether embodied compatibility effects can be reliably observed. Variations in experiment parameters such as timing, salience, or task difficulty have been shown to influence both the occurrence and the magnitude of these effects. The meta-analysis aims at systematically compiling studies on motor compatibility effects within the context of embodied language processing. Offering insights into the range of existing compatibility studies. In addition to aggregating overall effect sizes, the project explores the moderating roles of experimental features across different meaning dimensions.

Keywords: meta-analysis, compatibility-effect, language comprehension, embodiment

What can preschoolers learn about the script direction from observing reading adults?

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Before formal literacy training begins, preschool children may already learn about basic characteristics of the writing system used in their culture. One example is the direction of the script (e.g., left-to-right for the Latin script). Because directionality cannot be easily inferred from the script appearance, the question arises as to how preliterate children obtain such knowledge. One possible way may be through observing the spatial behavior of reading adults. In this study, we examine whether a short joint-reading session in which an adult traces the text with a finger while reading to a child may influence the way in which the child organizes early reading and writing attempts. We tested 136 German-speaking preschoolers (age range: 4.0-6.0 years). To prevent influences from early experience with the Latin script, we designed a novel script oriented vertically. First, the experimenter read the text to the child while tracing it with a finger either from top to bottom (half of the children) or from bottom to top (another half). Afterwards, the child completed three tasks: pretend reading (indicating the direction of the text), writing (copying a short text line), and visual search (finding a target letter among distractors). The results showed that the direction of reading to which the child was exposed influenced directional performance in all three tasks. We conclude that tracing text while reading may be one of the ways in which cultural knowledge about script directionality is transmitted to children before they are explicitly taught to read and write at school.

Keywords: directionality, reading, writing

Linguistic versus Non-Linguistic Knowledge in Temporal Interpretation: Testing One-Step and Two-Step Models of Language Processing

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A central question in psycholinguistics concerns whether linguistic knowledge and non-linguistic (world) knowledge are processed differently during sentence comprehension. Competing accounts propose either a two-step model, in which linguistic knowledge is integrated first, and world knowledge is incorporated only afterwards, or a one-step model, in which the two knowledge types are integrated simultaneously. It remains unclear whether these knowledge sources give rise to similar or distinct processing patterns. The present study examines how comprehenders respond to temporal inconsistencies arising from linguistic constraints or world knowledge. Linguistic inconsistencies are determined by incompatible time adverbials in past-under-past constructions with a complement clause, where a forward-shifted reading is not allowed, as in #One week ago, Emma said that David smiled two days ago. World-knowledge inconsistencies arise when adverbials contradict expected event sequences, as in #During the rehearsal, Emma said that David smiled at the concert, where the typical rehearsal-before-concert relation is reversed. Two experiments contrast these sources of inconsistency and comprehenders' sensitivity to them during temporal interpretation. An acceptability-rating study assesses whether linguistic and world-knowledge inconsistencies are recognised as similarly anomalous. A self-paced reading experiment examines the extent to which the same inconsistencies disrupt reading in similar sentence regions. Comparable disruption patterns would support the one-step model, whereas divergent patterns would support the two-step model. The findings of the present study will clarify whether it is necessary to distinguish between these knowledge sources from a language-processing perspective.

Keywords: temporal interpretation, linguistic knowledge, world knowledge, anomaly detection, language processing, psycholinguistics

Neural and Behavioral Mechanisms of Surprise-Driven Model Updating

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The flexible updating of internal models of the environment relies on the ability to distinguish informative from uninformative surprising outcomes in changing environments. Neural responses to surprise, particularly the P300 ERP component, have been proposed to reflect attention allocation as well as the updating of internal models of the environment (Donchin, 1981; Polich, 2007). In the current study we use EEG to investigate the role of surprise signals for the updating of internal representations in two conditions: (1) a reversal learning condition in which surprise signals are informative for model updating and (2) a (perceptually identical) oddball condition in which surprise signals need to be ignored. Behavioral data from 46 younger adults (ages 20-28) show behavioral adaption effects (increased accuracy and decreased reaction times) following informative surprising outcomes in the reversal learning condition in comparison to uninformative outcomes in the oddball condition. An analysis of the P300 component during outcome processing revealed a larger dissociation between surprising and unsurprising (informative) outcomes in the reversal learning condition as compared to the oddball condition. Furthermore, surprise trials in the reversal condition were associated with frontal positivity, potentially reflecting prefrontal cortex engagement during internal model updating. Overall, our findings suggest that behavioral adaptation and internal model updating following surprising informative feedback can be observed both at the behavioral, and neural level by examining ERP components such as the P300 as well as frontal activity. Future analyses aim to relate these neural dynamics to eye movements and pupil dilation.

Keywords: internal model updating, decision making, reversal learning, oddball paradigm, P300 component, surprise processing

Sequence learning transfer in the visual and motor domain

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Similar learning rates in visual and motor sequence learning (SL) tasks suggest a common underlying mechanism. Therefore, the ongoing study examined whether SL would transfer between domains. Response time (RT) was measured in a sequential button-pressing task. Participants ($n = 59$, mean age = 23.37 ± 2.94 years, 26 male) were randomly assigned to one of four groups: two SL transfer groups (visual-to-motor, VM; motor-to-visual, MV) and two control groups. Training lists for the SL groups repeated two randomised and four sequential elements; for the control groups, the lists contained only randomised elements. Learning was measured in the final training block, followed by a sequential transfer block of the opposite domain. Preliminary data were analysed. A mixed 2 (group: VM vs MV) * 2 (block: training vs transfer) * 2 (element type: randomised vs sequential) ANOVA on RT only found a significant interaction of block and element type, $F(1,26) = 10.642$, $p = .003$, $\eta^2 = 0.290$. In the final training block, RTs were shorter for sequential (600ms) than for randomised elements (623ms), $t(27) = 3.20$, $p = .003$, Cohen's $d = 0.392$, suggesting a similar SL rate in both domains. In the transfer block, in contrast, RTs did not differ between the sequential and randomised elements, $t(27) = 1.46$, $p = .157$, $d = 0.123$, indicating that learning did not transfer across domains. Similar SL rates in both domains support a common underlying mechanism. The absence of transfer indicates the existence of two distinct SL systems rather than a comprehensive one.

Keywords: sequence learning, motor learning, movement amplitudes

Impact of Material Difficulty on the Effectiveness of Interleaving for Categorical Learning

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The effectiveness of blocked versus interleaved arrangements of to-be-learned categorical material depends on how easily the categories can be distinguished. Interleaving typically enhances learning when categories are difficult to discriminate and helps learners detect subtle differences, whereas blocking is more effective when the categories are easily distinguishable. Our research examines whether these effects extend to naturalistic materials, such as painters' artistic styles. Participants learned to identify the styles of 12 painters. During learning, they saw six paintings per artist, accompanied by the artist's name. Half of the artists had highly distinctive styles, while the other half had styles that were difficult to differentiate. In Experiment 1, participants were assigned to one of two groups. In the blocked condition, all paintings by a given artist appeared consecutively before moving to the next artist. In the interleaved condition, paintings by different artists were mixed. Participants in both groups studied both distinctive and non-distinctive painters. In Experiment 2, the arrangement of paintings (blocked versus interleaved) was manipulated within subjects, while the distinctiveness of the material was manipulated between subjects. During testing, participants viewed new paintings by studied artists as well as paintings by previously unseen artists. They judged whether each painting came from a learned artist and, if so, identified the painter from a list. Surprisingly, results from Experiment 1 showed that interleaving improved recognition of paintings by distinctive artists compared to blocking. No differences were observed for non-distinctive artists. Data collection for Experiment 2 is ongoing.

Keywords: interleaving, learning strategies, categorial learning

Tracking Changing Risk Contingencies in Schizotypal Traits

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Background: Prior findings on ambiguous risk-taking in schizophrenia spectrum disorders are mixed. However, research on reversal learning, which requires adaptation to changing contingencies, consistently shows reduced flexibility and reward updating. We used a novel adaptation of the Balloon Analogue Risk Task (BART) that reverses risk probabilities and conducted exploratory analyses linking latent computational parameters of risk-taking with schizotypal traits. **Methods:** An online sample of adults ($n = 100$) completed our reversal BART. The task presented blocks of three balloon colors with different explosion probabilities. Halfway through the task, the colors with highest and lowest risk switched probabilities. Data were fit hierarchically by pre and post reversal block to three computational models: Scaled Target Learning, Exponential Weight Mean Variance, and Four Parameter. Participants also completed the Cardiff Anomalous Perceptions Scale, Peters Delusion Inventory (PDI), and Schizotypal Personality Questionnaire (SPQ). Correlation analyses examined relationships between model parameters and questionnaire scores.

Results: After reversal, higher SPQ scores were associated with lower Scaled Target Learning reward learning rates on cashed trials. Inverse temperature from the Exponential Weight Mean Variance model was positively associated with PDI scores both before and after reversal. **Conclusions:** Our preliminary findings suggest that higher schizotypal traits are linked to reduced reward learning when a once punishing contingency becomes safer, and that more stochastic behavior overall is linked to heightened delusional ideation. This indicates difficulty updating previously negative associations and may reflect trait-level mechanisms relevant to belief updating in ambiguous risk.

Keywords: Risk-Taking, Reversal-Learning, Schizotypy, Schizophrenia, Computational Modelling

Can Variable Encoding Lead to Memory Benefits in Free Recall?

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The encoding variability effect refers to a memory advantage that arises when the same materials are learned across multiple presentations that each emphasize different features of those materials. Prior work suggests that variability benefits are feature-specific: variable encoding of item features should aid item-information dependent tests (e.g., cued recall), and variable encoding of relational features should benefit relation-dependent tests (e.g., free recall). In our earlier studies we confirmed this pattern for variable encoding of item-specific features (via semantic orienting questions task) on a cued-recall test, but across two experiments, found surprising costs of encoding variable relational features (via story creation task) in free recall, compared to constant encoding condition. The present study aims to explain these recurring free-recall costs and to test whether any benefit of variability can be obtained for that test type. First, we ask whether covert retrieval practice – possible to utilize as a strategy in our constant-encoding condition but precluded in the variable condition – inflated performance in the constant condition. Second, we test whether combining encoding tasks within a single learning episode (introducing processing variability by mixing item-specific and relational tasks) produces superior free-recall performance compared with repeating either task twice in a variable manner. Results will clarify how feature and processing variability, together with retrieval demands, interact to produce either benefits or costs of encoding variability.

Keywords: encoding variability, free recall, item-specific processing, relational processing, long-term memory

Confidence-accuracy dissociations in forced-choice recognition

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Retrospective confidence judgements usually track participants' performance in memory tasks, so that experimental conditions which yield high performance also yield high mean confidence. However, Tulving (1981) documented two important exceptions using a 2-alternative forced-choice recognition test: 1) increasing choice similarity (i.e., the similarity between the two alternatives presented together on a given recognition trial) increased performance while reducing confidence, and 2) increasing memory similarity (i.e., the similarity of a given alternative to the memory trace) of an incorrect alternative – from dissimilar to highly similar – reduced recognition performance while having no effect on confidence. We perform a replication of Tulving's (1981) findings concerning choice similarity in a multi-block design to investigate potential changes in metacognitive monitoring due to experience with performing recognition tests. We further extend the findings concerning memory similarity of foils, manipulating memory similarity continuously by using only similar foils and varying the number of presentations of their parent targets. Tulving, E. (1981). Similarity relations in recognition. *Journal of Verbal Learning and Verbal Behavior*, 20, 479-496.

Keywords: recognition, confidence, choice similarity, memory similarity

Contextualising Context Effects in Memory Retrieval

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Context has long been recognised as a key factor in memory retrieval, yet the ways in which it has been studied as well as the effects it produces are diverse. This variability raises a fundamental question: when and why do context effects emerge? In this project, we aim to systematically examine the conditions under which context influences memory performance. We manipulate several theoretically motivated dimensions that may determine whether context effects arise and test their impact across three core paradigms of memory research: cued recall, free recall, and recognition. By comparing how these dimensions shape retrieval across tasks, we hope to clarify not only when context exerts measurable effects, but also whether our current conception of “context” itself requires refinement.

Keywords: Context, long-term memory, cued recall, free recall, recognition, attention

Memory in Your Hands: Notetaking enhances Card Memory in a Concentration Game

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Cognitive offloading, defined as the externalization of information, is ubiquitous in everyday life. However, its influence on internal memory remains under debate, with findings ranging from detrimental effects (e.g., Sparrow et al., 2011, *Science*, 333, 776–778) to clear benefits (Eskritt & Ma, 2014, *Memory & Cognition*, 42, 237–246). The present study examines how note-taking—a common and active form of offloading—affects the encoding and later retrieval of offloaded material in an adapted concentration game. In a laboratory experiment ($N = 132$), participants completed five rounds of the game with distinct card sets. Half of the participants were instructed to take notes, whereas the others had to rely solely on internal memory. After a brief delay, all participants completed a free recall test, a picture recognition test, and a position recognition test. Participants in the note-taking condition recalled significantly more items in both the free recall and position recognition tests, whereas no differences emerged in picture recognition. These findings suggest that note-taking can enhance internal memory for conceptual and spatial information. Preliminary data from a second experiment ($N = 139$) further indicate that noting down meaningful units (words) leads to greater memory benefits than noting down less meaningful units (letters). In sum, the experiments indicate a positive impact of cognitive offloading on internal memory, which we attribute to deeper elaboration during encoding.

Keywords: notetaking, cognitive offloading, memory

Are these my Hands? Effects of Perspective and Social Distance on Automatic Motor Activation

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Construal Level Theory (CLT) proposes that socially close stimuli are represented more concretely than those that are socially distant. Teskey (2022) investigated whether images of hands automatically activate motor representations in a choice reaction-time task by manipulating the compatibility of task-irrelevant hand images (left or right) and the side of the afforded reaction (keypress with left or right hand). Interestingly, the observed compatibility effect was positive in one experiment with egocentrically presented hands, but negative in another experiment with allocentric hands. From the perspective of CLT, these findings suggest that egocentric hand images—being socially closer to the self—engage more concrete, modal representations than allocentric hand images, which should be perceived as more socially distant. In the present study, we replicated Teskey's findings in a within-subjects design. Specifically, we observed a positive compatibility effect for egocentrically presented hands but no reliable effect for allocentrically presented hands. In three additional experiments, we introduced alternative distance manipulations. When egocentric human hands were contrasted with boxing gloves and non-human (monkey) hands, socially closer stimuli again elicited larger compatibility effects than socially more distant ones. However, a more subtle social distance manipulation involving images of young versus old hands failed to produce differential compatibility effects. Together, these findings suggest that response activation is sensitive to social distance when stimuli differ sufficiently in their perceived proximity to the self. Socially closer stimuli appear to elicit more modal sensorimotor representations, whereas socially distant stimuli engage more abstract, amodal processing.

Keywords: construal level, psychological distance, abstraction, mental representation

Beyond Response-Conflict Adaptation: How do we Adapt to Task Conflict?

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Cognitive control theories have long emphasized information control, the processes that detect and resolve conflict between competing response tendencies or suppress irrelevant semantic activations. Yet by focusing almost exclusively on response-level interference, these models have largely ignored a complementary mechanism: task control, which selects, maintains, and switches between entire task sets and actively inhibits competing tasks. I will show that task control plays an important role across a variety of paradigms, including the colour-word Stroop, the Eriksen flanker task, and numerical-cognition tasks. I will make a distinction between proactive and reactive control modes, demonstrating that classic conflict-adaptation effects (Item-Specific Proportion Congruence, List-Wide Proportion Congruence, and Congruency Sequence Effects) can be driven not only by adjustments in information control but also by shifts in proactive task control. Finally, I will illustrate how information and task control dissociate in developmental populations, in a series of experiments comparing healthy younger adults with older adults.

Keywords: Cognitive Control, Task Control, Stroop Task

Seeing vs. Reading Conflict: Adaptation Effects Across Pictures and Sentences

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Cognitive research asks how we deal with conflict, and what cognitive adjustments occur during information processing. According to the conflict monitoring theory (Botvinick et al., 2001), registration of conflict signals the need for increased cognitive control. Traditionally, this phenomenon has been studied using simple conflict tasks, such as the Stroop task. More recently, however it has been proposed that conflict processing may operate as a domain-general mechanism. Specifically, some authors argued that conflict arising in the language domain can influence subsequent conflict processing in unrelated domains (e.g., Simi et al., 2023). We here examined whether verbal and pictorial conflicts elicit response slowing, a well-documented effect in the sensorimotor domain, and whether conflict processing in pictures resembles that observed in language. In two studies, participants evaluated sentences and pictures that were either congruent or incongruent with world knowledge (e.g., a panda drinking beer [incongruent]). While sentences elicited the expected conflict effect - longer RTs for incongruent compared to congruent stimuli - this effect did not emerge for pictures. This pattern suggests that conflict processing varies across stimulus modalities, pointing to a potential domain-specific rather than domain-general mechanism. Building on this, an ongoing study examines whether conflict in one modality can trigger cross-modal adjustments influencing processing in another - for instance, between pictorial and linguistic representations. To our knowledge, this is the first study to investigate how individuals detect conflicts between incoming information and world knowledge across different modalities, advancing our understanding of the cognitive architecture of conflict processing across domains.

Keywords: language processing, picture processing, cognitive control, conflict adaptation, world knowledge violations

Does Cognitive Offloading During Retrieval Practice Influence the Testing Effect?

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Cognitive offloading (CO) refers to the use of external tools to reduce cognitive demands during information processing. While CO typically enhances initial task performance, it often impairs later memory when the external aid is no longer available. Decisions to offload are closely tied to metacognitive judgments about one's own cognitive abilities as well as the perceived reliability of, or trust towards, the available external tool. Moreover, CO can inflate memory confidence, creating "knowledge illusions" where individuals overestimate how much they actually remember after offloading. As generative artificial intelligence tools are increasingly used for learning and information retrieval, understanding their cognitive consequences becomes critical. In the present study, we aim to investigate how ChatGPT use interacts with the testing effect, the well-established finding that active, but effortful retrieval practice enhances later memory relative to a restudy opportunity. Using a two-day design, participants on day 1 read educational texts and are then asked to practice their contents by means of restudy or retrieval practice (short-answer questions). Retrieval practice is carried out either without any assistance (no offloading), with the option to use ChatGPT (free-choice offloading), or with mandatory ChatGPT support (forced offloading). Additionally, judgements of learning as well as a measure of trust in ChatGPT are collected. On day 2, participants complete memory tests on all four texts without assistance to assess long-term retention. The results will show whether and how cognitive offloading interacts with desirable difficulties for learning, as they typically become evident in testing effects.

Keywords: Cognitive Offloading, Testing Effect, Metacognition, Generative AI

Boredom and Flow: (Mal-) Adaptive Secondary Tasks While Driving

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Boredom is a common experience among drivers and is associated with inattention, decreased driving performance, and a increased accident rate. Identifying effective strategies to mitigate boredom is therefore critical for enhancing road safety. Using secondary tasks while driving has generally been associated with a decrease in driving performance. While secondary task engagement during driving is typically associated with performance impairments, this study proposes that the nature of the secondary task is crucial in determining its effects. Specifically, it draws on the Cognitive Control Hypothesis and Theory of Optimal Arousal as a basis for understanding possible positive effects of secondary tasks. Secondary tasks might be suitable for counteracting boredom, provided they do not require a significant amount of cognitive control to execute. A questionnaire was constructed to measure secondary task usage and attitudes, drivers' perception of boredom and flow, driving safety, as well as other related factors. Results indicate that engaging in certain secondary tasks can reduce boredom and facilitate a flow-like state characterized by sustained attention, enhanced task engagement, and positive affect. No negative impact on perceived driving safety was observed. While the study's scope limited the ability to draw definitive conclusions about objective safety outcomes, the findings align with prior research suggesting that appropriate secondary tasks may support driver engagement. These are highly automated, well-trained tasks which are not reliant on visual attention. Further empirical investigation using behavioural and physiological measures is warranted.

Keywords: Boredom, Flow, Driver, Driving Safety, Secondary Task, Cognitive Control Hypothesis, Theory of Optimal Arousal

Learned Threat Cues Elicit Early Anticipatory Attentional Avoidance: An Eye-tracking Study

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Threatening content takes priority over neutral or other emotional stimuli in attentional processing. However, attentional bias toward threats can occur even before the threat is presented, if they are anticipated. This anticipation can lead to avoidance behavior. Across two experiments, we investigated whether predictive cues associated with threatening content elicit avoidance before the threat appears. We used a cued Visual Probe Task in which neutral cues (100, 500, or 1000 ms) predicted the later presentation of either threatening or neutral images; in 50% of trials image or images followed the cue, and in 50% a target-detection task followed. Behavioral and eye-tracking measures assessed how these learned associations shaped attentional allocation. In Experiment 1 (behavioral $N = 33$; eye-tracking $N = 23$), cues and targets appeared in the same spatial locations. Participants were slower to detect targets preceded by threat-predictive cues, and eye-tracking showed gaze shifted farther from these cue locations—particularly at longer cue durations. In Experiment 2 (behavioral $N = 51$; eye-tracking $N = 22$), cues appeared centrally while targets appeared in the screen corners. Here, participants detected targets faster following threat-predictive cues, again accompanied by greater gaze distancing from the threat-associated cue. Across both experiments, threat associations did not influence the onset of gaze shifts toward the target, suggesting that avoidance operates early during anticipatory cue processing. Overall, participants learned to associate threatening content with the predictive cue and avoid its spatial location. These findings suggest that anticipatory attentional avoidance reflects a distinct process emerging from learned threat associations.

Keywords: attention bias, threat processing, anticipation, eye-tracking, avoidance

Location probability learning in the real world

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In most visual search experiments, target and distractor stimuli are presented in a static, non-overlapping, high-contrast, two-dimensional configuration from an aerial perspective. The real world is usually far from this ideal, which often makes it a little more difficult for us to find the things we are looking for. This pre-data poster describes an experiment in which we will transfer the location probability learning (LPL) paradigm to a more naturalistic context. Participants will complete a classic visual search task under two conditions: (1) A standard visual search task with two-dimensional stimuli on a computer monitor, and (2) an interactive visual search task with three-dimensional Lego bricks in an assortment box. In both conditions, target stimuli will appear with a probability of 50 percent in one quadrant and with 16.7 percent in one of the other three quadrants without the participants' knowledge. We will compare reaction times between high and low probability target locations to find out whether participants implicitly learn this probability bias and adjust their search strategy accordingly. We are also interested in whether there are transfer effects from the standard visual search task to the interactive visual search tasks, and vice versa. We welcome any feedback and look forward to discussing the planned project with you.

Keywords: visual search, visual attention, location probability learning

The affect of task set on performance in crowded stimuli perception

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Processing stimuli in the visual periphery is impaired by adjacent stimuli, a phenomenon known as visual crowding. The present study investigates how task type (localization, feature detection, categorization, and target presence detection) and stimulus characteristics (shape and category) affect crowding. Both offline and online experiments were conducted. In two experiments, we used a 2-alternative forced choice (2AFC) paradigm, presenting crowded targets (K, U, 3, 4) flanked by one or three distractors (E, S, 7, 8). Stimuli were presented at 8° eccentricity for 300 ms, with a horizontal spacing of 0.5°. Participants completed four blocks, each corresponding to one task. The block order was counterbalanced across participants. Classical results from crowding studies were observed: participants performed better in the 1-flanker condition compared to the 3-flanker condition. We also observed strong effects of tasks on performance: localization showed the lowest accuracy, while detection yielded the highest. Feature detection and categorization tasks showed similar performance levels. The impact of stimulus features and categories also varied by task. For example, curved targets surrounded by curved flankers led to lower performance in the detection task but higher performance in categorization. Digit targets surrounded by letter flankers led to worse performance in categorization but did not affect detection or localization. Reaction time was fastest in the detection task. Overall, the results show that both the tasks participants are asked to perform and the stimuli they are presented with influence performance in crowded-stimulus perception tasks. Findings are discussed in terms of the hierarchical organisation of visual processing.

Keywords: Visual crowding, cognitive task effects, peripheral vision

Testing neural circuit mechanisms underlying visual illusions of texture border and size

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How does the human brain recognize and localize objects? One strategy is to localize the borders between distinct visual textures. Li's (2000) neural circuit model of primary visual cortex (V1) proposes that texture borders are localized through lateral neural interactions in V1, specifically iso-oriented inhibition and co-linear excitation. However, Popple (2003) measured border localizations which are inconsistent with the biases predicted by the V1 model. So far, it remained unclear if the limitations of Popple's psychophysical experiment, specifically central viewing and prolonged stimulus duration of 150 ms, allowed confounding feedback from visual areas beyond V1. In this experiment we test if the biases in localizing borders between orientation textures contradict the V1 model even in the case of stimuli presented for durations as short as 20 ms in peripheral vision. We replicate and extend Popple's experiment, and compare our results with predictions simulated by a replicated version of the V1 model. The biases measured in this experiment might falsify the V1 model explanation and support alternative neural mechanisms of visual texture segmentation. Else, the V1 model and our results predict a new visual size illusion inverse to the well-known Helmholtz illusion (1867). Future comparative study of both illusions might open up a new experimental and theoretical avenue to understand the contributions of V1 and higher visual areas to not only visual texture segmentation but also size perception.

Keywords: texture segmentation, primary visual cortex, contextual influences, neural circuit model, saliency, Central-peripheral dichotomy (CPD), size perception

Effects of iconic language on visual awareness

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When looking for a word, you may have resorted to producing its sound instead, for example saying “quack” instead of “duck”. Such lexicalisations of real-word sounds are called onomatopoeias, and are mainly used by children before they learn the arbitrary words, typically calling a dog “woof”. Research has shown that onomatopoeic words are easier to learn at any age, supporting the grounded cognition theory in which language and sensory-motor systems interact. However, little is known about the role of onomatopoeias in the adult language and their interplay with perception. To help fill this gap, we compared visual detection of animal and object photographs under conditions of reduced attention in an attentional blink task. The photographs (e.g., a phone) were preceded either by a word (e.g., “phone”), a sound (e.g., of a telephone), an onomatopoeia (e.g., “dring”), or neutral versions (prosody-only). We found no advantage of iconic language on perception. Instead, inanimate onomatopoeias were associated with reduced detection rates compared to every other type of cue (animate onomatopoeias, words and sounds), suggesting that inanimate onomatopoeias interfere with perception, supporting the grounded cognition theory. Considering the higher number of false alarms after onomatopoeic cues, it seems that they elicit higher mental imagery without enhancing detection, but such lower accuracy could also be explained by a general lower familiarity by adults with this type of words.

Keywords: language, iconicity, onomatopoeias, visual perception, awareness, audio-visual processing

Perceived Task Performance is Linked with Accuracy and Predicts Emotional Experience

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Performance in visual working memory (VWM) fluctuates with task difficulty and these fluctuations covary with emotional experiences during task execution (Laybourn et al., 2022). We asked whether perceived task performance (PTP) – how well participants think they performed – is linked with objective accuracy, and whether it adds unique value in predicting discrete emotions beyond accuracy and task difficulty (set size).

Twenty-six adults (17 female; $M_{age} = 25.5$, $SD = 3.38$; $N = 22$ for models requiring recall error) completed eight experimental blocks of a continuous color-report task (set size 4/8). For each block we computed recall error and self-reports of joy, pride, anger, frustration, boredom, and PTP. We used random intercept, fixed-slope linear mixed models with within-person (cluster-mean) centering to test our assumptions. When recall error exceeded a person's mean, PTP decreased ($\beta \approx -0.038$, $p < .001$). Controlling for recall error and set size, higher-than-usual PTP predicted more joy and pride as well as less anger, frustration and boredom (all $ps \leq .016$, Holm-adjusted). Between persons, participants who overall felt they performed better across the experiment reported higher average joy and pride when controlling for average recall error, but showed no reliable associations with anger, frustration, or boredom.

We conclude that beyond objective accuracy and difficulty, how good participants think they performed carries unique signal for discrete emotions during VWM task execution. These findings highlight a metacognitive pathway linking performance monitoring to affect and warrant replication with larger samples.

Keywords: perceived task performance, metacognition, discrete emotions, mixed-effects modeling

Confidence in Prevalence-Induced Concept Change

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Prevalence-Induced Concept Change (PICC) is the tendency for people to change their concepts in response to shifts in the prevalence of corresponding information in the environment (Levari et al., 2018; Devine et al., 2023). For instance, when people see fewer overweight bodies, they shift their concept of an overweight body and start judging some average bodies as overweight (Devine et al., 2022). Some people, particularly older adults, are not susceptible to the PICC effect (Devine et al., 2023). Other studies show that older adults are generally less likely to change their beliefs than younger adults and show overconfidence in their decisions (Prims & Moore, 2023). We suggested that high confidence in the original concepts (before the prevalence shift) may determine the susceptibility to the PICC effect. In a preregistered study ($N = 81$), we asked participants to categorise fictional characters (Bouba and Kiki) and rate the confidence in their judgements. The prevalence of the target stimuli (Bouba) was stable (50%) across 16 blocks of trials in one group and dropped to 10% after 4 blocks in the other group. Our results show that higher confidence before the prevalence shift is associated with a lower probability of false alarm errors after the prevalence shift. The same association is found between the false alarm errors and the decision boundary parameter, which can also be interpreted as a final confidence in the decision (Lee et al., 2023). Thus, we found the first evidence that confidence may serve as a mediator of the PICC effect.

Keywords: Prevalence-Induced Concept Change, Confidence, Categorisation

Comparing M-Ratio to Information-Theoretic Measures of Metacognition

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Human behavior depends on evaluating uncertainty in decisions—a metacognitive ability. This ability can be quantified in various ways. Typical measures are meta-sensitivity (meta- d') and metacognitive efficiency (M-Ratio). These measures are derived from a Signal Detection Theory (SDT) framework and make (truncated) normal noise assumptions. They were, together with 15 other measures, recently assessed by Rahnev (2025, PB&R) using real world data (rather than just simulations like previous studies). Results on validity, precision, susceptibility to nuisance variables, and reliability led Rahnev to conclude that M-Ratio outperformed the other 16 measures. Nevertheless, it did not fulfill all desiderata. In fact, M-Ratio shows a slight tendency to overcorrect for a nuisance variable and, as do most other measures, exhibits poor reliability. Thus, there is room for improvement. A recently proposed, conceptually intriguing family of measures that were not included in this assessment are measures based on Information Theory: meta-I, RMI, meta-U, and others (Meyen, 2025, OpenMind). These measures do not assume specific noise distributions allowing them to be applied in a wider variety of contexts and tasks. But how do these information-theoretic measures compare against the established measures such as M-ratio in real data? We will close this gap by comparing the established SDT-based measures with these newly proposed information-theoretic measures. We will do so by using Rahnev's assessment battery and demonstrate on which particular data these measures disagree. This will give guidance for future research on when to employ which of these measures.

Keywords: metacognitive ability, type 2 performance, M-Ratio, meta-I

Does a calculation prodigy differ from other individuals in very basic number processing?

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Calculation prodigies, i.e., individuals characterized by exceptional arithmetic skills, have been tested since the dawn of experimental psychology. However, little is known about whether calculation prodigies differ from other individuals in very basic number processing. To investigate this, single-digit Parity Judgment and Magnitude Classification tasks were used and standard effects like distance, size, SNARC, MARC and odd effects were investigated and compared to control groups. We tested GM, a prodigy holding world records in mental calculation, e.g., calculating the 13th root of a 100-digit number, acting German champion in calculation. With bootstrapping, we tested whether GM revealed hallmark effects of basic number processing and estimated corresponding CI. We compared his performance to mathematicians, engineers, professionals in social sciences and humanities, and a sample from the general population. GM's performance in these tasks was generally similar to control groups. We found distance and size effects, which can be seen as evidence for representing numbers in an analogue way. Presence of the SNARC effect in the magnitude task, but not in the parity task suggests that GM does associate magnitudes with space when magnitudes are needed for the task. Presence of MARC and odd effects indicate similar parity representation and their associations with space as in control samples. In conclusion, hallmark effects in basic number processing do not seem to be different in a prodigy. Nevertheless, there might be some intraindividual differences in the prodigy's profile, whose difference to the control group may be masked by substantial interindividual variability in unselected populations.

Keywords: numerical cognition, exceptional ability, prodigy

Influence of Cultural and Linguistic Context on Spatial-Numerical Associations in German-Turkish Bilinguals

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Spatial representations of numbers vary with reading/writing directions and - as recently discovered - with cultural directional preferences (i.e., directional habits in visuo-motor activities or directional associations in certain cultural environments). This was observed in a between-subjects study with the SNARC effect (Spatial Numerical Association of Response Codes; faster responses to small/large numbers with the left/right hand, respectively). However, previous studies showed that the SNARC effect even depends on reading-direction contexts within-subjects in bilingual samples. The current study investigated possible context influences of cultural directional preferences within the same reading direction by examining the SNARC effect in German-Turkish bilinguals living in Germany. Two experimental sessions (conducted entirely in either German or Turkish, minimum separation of one week) were carried out per participant. Each session consisted of the Revised Cultural Directional Preferences Questionnaire, a covariates questionnaire, and a parity judgment task with number words. Preliminary results (currently $n = 40$ of $N = 92$ planned) (1) showed a SNARC effect in the parity judgment task in each context, as expected; (2) did not show any difference in the SNARC effect between the Turkish and German contexts, contrary to our predictions. In explorative analyses, it seemed that cultural directional preferences did not change within-subjects as a function of cultural context and consequently, the spatial-numerical associations did not vary either. We conclude that while reading/writing direction contexts seem to modulate spatial-numerical associations, cultural directional preferences and their impact seem to be much more stable within-subjects.

Keywords: SNARC effect, spatial-numerical associations, bilingualism, cultural directional preferences, cultural context, parity judgment, numerical cognition

Of facts and faces: Social saliency and visual identifiability shape third-party interventions

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When witnessing norm violations, initially uninvolved observers often invest own resources to restore justice, either by punishing the offender or compensating the victim. While explicit instructions can influence participants' cognitive focus on the highlighted party and their subsequent actions, the current study investigated more implicit means of shaping third-party decision-making. In four preregistered experiments ($N = 436$), participants played an incentivized third-party justice game. We examined how subtle social cues (face visibility, gaze direction, emotional expression, personal information) affect preferences for (i) intervention type (punish, compensate, do nothing) and (ii) its intensity. Controlling for baseline behavior, justice sensitivity, and empathic concern, Experiment 1 showed that displaying the offender's portrait photo increased punishment, while showing the victim's photo increased compensation; gaze direction of the displayed person had no additional effect. In Experiment 2, when both photos were presented simultaneously, gaze direction did not affect decision preferences, but compensation intensity when the victim displayed direct (vs. averted) gaze. Experiment 3 replicated the visibility effect of Experiment 1 and showed that sad (vs. neutral) facial expressions did not sway decision-making. Shifting from visual to verbal cues, Experiment 4 revealed that written information (name and personal fact) about either party did not affect third-party decisions. Across experiments, baseline preferences and transgression unfairness consistently influenced intervention tendencies. We conclude that social cues, particularly those capturing bottom-up social attention (e.g., faces), can shape third-party decisions. Findings are also discussed in the context of the identifiable victim (and offender) effect.

Keywords: third party preferences, social attention, gaze, saliency, identifiability

Investigating avatar-based effects of spatial compatibility and mental rotation

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Effects of the orientation of a task-irrelevant avatar have been considered evidence of automatic perspective taking. Specifically, previous studies found that giving left- vs. right-sided key press responses to a target stimulus presented on the sagittal midline of the screen, accompanied by an avatar rotated by 90° from the participants' orientation, yields faster responding on the side that matches the laterality of the target viewed from the avatar's perspective (i.e., an avatar-based Simon effect). In previous studies, the orientation of the avatar was held constant during blocks of trials, preventing inferences regarding flexible, trial-to-trial, perspective taking. Presenting the avatar with clockwise or counterclockwise tilt, chosen randomly on each trial, we examined whether an avatar-based Simon effect would also occur under conditions of variable and uncertain avatar orientation. To further extend investigation of automatic perspective taking we intermixed trials of a mental rotation task requiring judgment whether a stimulus character was presented in normal or mirrored format. This character occurred in a central position viewed from both the participants' and the avatar's perspective and was rotated by 90° in the picture plane (i.e., presented in upright or inverted format viewed from the avatar's perspective). An avatar-based Simon effect occurred. Performance in the mental rotation task was not better, however, when the character was presented in upright format viewed from the avatar's perspective. Our results thus suggest flexible left-right coding of the position of stimulus objects according to the avatar's orientation but cast doubts regarding more extensive forms of automatic perspective taking.

Keywords: perspective taking, spatial compatibility, mental rotation

Conflict processing in asymmetric joint action: Co-Actor triggered response conflicts are amplified by free choice

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Asymmetric joint action describes scenarios in which a decider oversees goal attainment, while co-actor(s) contribute as followers. When conflict arises, deciders must resolve competing response options (underdetermined responding), whereas followers must prioritize the decider's information (selection-for-action). To examine this role-dependent conflict management, we introduce a novel online paradigm where conflict is elicited by a co-actor's competing response. The participant and a co-actor collaboratively move a target via key press from the bottom center to a top corner of the computer screen (relay-like). First, the participant covertly chooses one corner (left/right), then the co-actor overtly moves the target to an intermediate position (left/right), either congruent or incongruent with the participant's choice. Finally, the participant moves the target to its final position (left/right). Critically, in the basic paradigm, participants first always had to follow the co-actor's input (follower block); then they were free to follow either their own or the co-actor's choice (decider block). Across five experiments (leader block, reversed block order, variations in co-actor visibility), we observed that congruency effects were significantly amplified in decider blocks and more so when the co-actor was visible. In addition, congruency sequence effect were present in all experiments. These findings suggest that co-actor-triggered response conflicts are processed differentially depending on freedom of choice, substantiating complementary roles of conflict monitoring (response conflict in deciders) and selection-for-action (information conflict in followers/leaders) in conflict management. Moreover, they extend the scope of cognitive control to free-choice contexts and a novel type of conflict task.

Keywords: joint action, cognitive control, conflict, conflict adaptation, free choice, forced choice, social cognition

Self-Reported Uncertainty in Decision-from-Experience Sampling

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Uncertainty is known to affect choice, but less is known about its effects on the sampling process leading up to choice. While secondary-data studies have found uncertainty to affect sampling behaviour in decision-from-experience tasks, uncertainty was only inferred from decisions but not directly assessed. We designed an experiment with greater control over uncertainty manipulations while also measuring self-reported uncertainty. One hundred and thirty-seven participants completed 6 decision-from-experience binary lottery trials, freely sampling from two discrete distributions and finally selecting one. We varied across trials the information given on the distributions and their properties (variance, number of distinct outcomes). Self-reported uncertainty was assessed multiple times throughout the sampling process. We found that people sampled more when presented with a higher-variance distribution, while sampling did not increase when the distribution had a larger number of distinct outcomes. When measured after five samples were drawn, higher self-reported estimation uncertainty—uncertainty about the distribution's average—was associated with more samples being drawn in that trial. However, the same was not found for self-reported structural uncertainty—uncertainty about the distribution's characteristics. Additionally, more sampling increased the accuracy of the representation of the outcome distribution in a distribution-builder task. Our findings are in line with theories that see sampling as being driven by uncertainty reduction. They also make an initial case for wider implementation of self-report measures of uncertainty: Currently largely underutilised, they allow for real-time trial-level measurements. To further corroborate our findings, we plan to test computational measurement frameworks from the literature on this data.

Keywords: Uncertainty, decision-from-experience, self-report, search, stopping rule

Having a Similar Action Planned Impairs Action Stopping

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From time to time, agents have to abandon an action plan immediately before it is executed. The stop-signal task measures stopping performance using stop signal reaction times (SSRTs). It is possible that such performance is influenced by other action plans prepared for later use while the said action is to be stopped. This study combined a stop-signal task with an ABBA sequence: first, an action A is planned; then, an action B is planned; finally, action B is executed before action A. In some trials, action B was to be selectively stopped, as signalled by a stop signal. The Go trials replicated the classic result that performance of action B is impaired if it shares some, but not all, features with action A (partial overlap costs). Importantly, the same pattern emerged for the SSRTs in the stop trials. The performance of stopping action B was impaired when it partially overlapped with the planned action A. Given these results, it seems that the Stop process is subject to similar selection constraints as the Go process. Stopping the execution of an action plan is less efficient if there is potential confusion with another action plan. These results suggest that the stopping mechanism operates on the specific features of an action and could therefore help to refine the mechanism behind action inhibition.

Keywords: Stopping, inhibition, action planning, feature binding

Traces of errors in action sequences: Binding leverages goals and errors asymmetrically for adaptive action control

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The automatic binding and retrieval of responses serve as core mechanisms in the control of action sequences, providing efficient shortcuts to recent actions. Although binding has traditionally been assumed to occur only for successfully performed actions, recent evidence demonstrated binding for action slips (actions, in which intentions were correct but execution failed) with co-occurring stimuli and effects. Yet, it remains unknown how action slips are embedded within ongoing action sequences and how their cognitive representation shapes subsequent behavior. Here, we investigated which aspects of an action slip become integrated with surrounding correct actions. Participants performed a speeded response task. Following an action slip, we measured facilitation for the repetition of either the previously intended correct response of the action slip, the previously executed erroneous response, or a neutral response. Two asymmetric binding patterns emerged. When examining integration with the subsequent correct response, both the intended correct response and the actual error were bound to that next response. In contrast, for integration with the preceding correct response, only the intended correct action was bound and later retrieved. This dissociation highlights two adaptive functions of error-related binding: (1) prioritizing goal-consistent representations that support future successful performance, and (2) integrating executed errors into the action sequence in a way that may support learning about contingencies and structure in the environment.

Keywords: Action control, Action slips, Error processing, Binding and retrieval, Response–response binding

Action selection by temporally close transitions? Subtle evidence from the removal of tactile stimulation

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The ideomotor principle holds that actions can be initiated by anticipating their perceptual effects. While recent work suggests that effect anticipations rely on transitions rather than end-states, this has been shown only for visual effects. Here, we extended present approaches by investigating tactile effects. In two experiments, keypresses stopped vibrations on either the same (transition-compatible) or opposite (transition-incompatible) key, and we varied task relevance of these effects. In Experiment 1 (task-irrelevant effects), compatibility influenced neither response times nor error rates. In Experiment 2 (task-relevant effects), response times were still not significantly influenced, but the error rates provided subtle evidence for transitional representations of tactile action effects. These results are in line with recent work that challenges the predominant assumption of state-based effect representations.

Keywords: motor control, ideomotor effect anticipations, representational format, body-related action effects

Deciding while moving: Body-related effects of concurrent movement bias embodied choices

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People often have to decide how to continue an already ongoing course of actions. For example, one may decide on which side to pass an obstacle while already walking toward it. In such situations, choices could be biased toward the potential actions with lower effort (motor cost bias) and the potential actions that overlap spatially with the ongoing movements (cognitive crosstalk bias). In this study, we examined whether choices during concurrent movement are affected by motor cost and cognitive crosstalk biases. Further, we examined whether body-related movements associated with potential actions (e.g., the direction of finger movements) or the resulting visual effects in the environment give rise to cognitive crosstalk biases. In two virtual embodied choice experiments, participants controlled the horizontal position of a cursor while occasionally making decisions about whether to evade oncoming obstacles on its left or right. We orthogonally manipulated the relationship between the cursor state and the motor costs required to circumvent an obstacle on either side, as well, as the relationship between the finger movements required to control the cursor and the resulting cursor movement on the screen. The results showed that both motor costs and cognitive crosstalk biased participants' choices. The cognitive crosstalk bias was determined solely by the body-related movement direction. In summary, embodied choices during movements are biased toward actions with lower motor costs and toward actions in which body-related movements overlap spatially with the ongoing movement.

Keywords: embodied choices, decision making, motor-cognitive interference, action effects, motor control, ideomotor theory, embodiment

Affective evaluation of self-produced action-effect episodes

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Predictable action outcomes are central to goal-directed behavior. Prior research has shown that expected action effects confer performance advantages. Yet the mechanisms underlying this phenomenon remain debated. Across six preregistered online experiments ($N = 702$), we examined whether the expectancy of an action effect shapes the affective evaluation of corresponding action-effect episodes. In each study, participants responded to stimuli by clicking on buttons that produced effects with either high (stimulus-congruent) or low (stimulus-incongruent) expectancy. Induced affect was assessed using both implicit (affective priming) and explicit (valence ratings) measures. Overall, high-expectancy episodes elicited relatively more positive affect than low-expectancy episodes. For our implicit measure, this effect persisted unless correspondence among all task events (stimulus, response and effect) was simultaneously reduced (Experiments 2+3). Furthermore, this outcome could not be attributed to mere visual mismatch between stimulus and effect (Experiment 4) and was observed even when expected effects were no more, or even less, likely to occur than unexpected ones (Experiments 5+6). These findings suggest that expected action outcomes elicit positive affect, thus offering a parsimonious explanation for performance advantages previously attributed to more complex mechanisms like ideomotor accounts or response monitoring.

Keywords: affect, action control, conflict monitoring

Reformulating the Hyperbolic Function: The Money-Time Ratio as a New Index of Delay Discounting

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Delay discounting refers to the tendency to prefer smaller, immediate rewards (e.g., \$100 now) over larger, delayed ones (e.g., \$500 in ten years). The traditional discounting parameter k , derived from the hyperbolic discounting function, is commonly used to describe the rate of discounting. However, its estimation relies on indifference points, the calculation of which often violates theoretical assumptions in practice. We propose a novel quantification approach, termed the Money-Time Ratio (MTR). The MTR is an algebraic rearrangement of the hyperbolic function that directly solves for the k parameter without the need to calculate indifference points for each delay. Here, we aimed to compare how well the two measures capture participants' delay discounting behavior, assessed through repeated choices between immediate and delayed rewards. Results indicated that the MTR demonstrated superior psychometric properties compared to the conventional hyperbolic model: it provided a better fit to delay discounting data and produced k values that were normally distributed. We conclude that the MTR represents a simple, robust, and theoretically consistent alternative to traditional measures of delay discounting.

Keywords: delay discounting, intertemporal choices, decision-making, model comparison, self-control

Extending evidence on structured group decision-making: Group strategy or individual learning?

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The question under which conditions interacting groups have the potential to achieve group synergy has been a focal point of psychological research for decades now. More recently, Keck & Tang (2021) have demonstrated that structuring a group in such a way that one group member has the sole responsibility for the group estimate may improve the performance of interacting groups in quantitative estimation tasks. However, the specific group process which allows structured groups to create more value from interacting than consensus groups remains elusive. There seem to be two possibilities: Group-to-individual (G-I) transfer and differential weighting. The aim of the presented study therefore is twofold: First, we test whether the main finding of Keck & Tang (2021) replicates. Second, if the effect can be replicated, we explore which specific group process may be responsible for the increased accuracy of leader groups: G-I transfer or differential weighting. To achieve this, we conduct a pre-registered online experimental study with a mixed 3x2 design, with decision-making structure (consensus vs. leadership vs. nominal) as a between-subjects factor and population bias (high vs. low bias) as a within-subjects factor. We further adjust the experimental procedure (from blocked to alternating), which allows us to control for G-I transfer, since increases in individual capability after working in a group are reflected in the individual estimates. Data collection follows a Bayesian sequential testing plan (minimum $N = 300$, up to $N = 600$) and will be completed ahead of the conference. Results will be available for presentation.

Keywords: Group decision-making, group learning, group synergy, G-I transfer, differential weighting

Cognitive and cue-related determinants for the existence and strength of coherence shifts

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Normative accounts of probabilistic inference assume that cue weights remain fixed during choice. Yet many studies document preference-induced changes in subjective cue weights, so-called coherence shifts, such that the weights of preference-consistent cues increase while those of preference-inconsistent cues decrease. Although coherence shifts appear across various tasks, moderators of their magnitude remain unclear. The model of metacognitive control of decisions (MCD) predicts that deliberation amplifies coherence shifts. Complementing this, we derived cue-level coherence-shift predictions from what is, to our knowledge, the first parallel constraint satisfaction model of decision making (PCS-DM) simulation targeting coherence shifts. The simulation suggests that coherence shifts occur only for cues that discriminate between options and are larger for cues with lower initial subjective validity. Building on these predictions, we test whether cue discriminability, initial subjective validity, and decision mode (intuitive vs. deliberate) modulate coherence shifts. In two experiments, participants choose between vacation locations based on weather forecasts from commonly used weather apps (cues). The subjective validity of four (Exp. 1) or five (Exp. 2) weather-app cues is rated before and after each choice. Coherence shifts are operationalized as the (absolute) difference of the pre-post change in subjective cue validity. Preliminary results indicate the predicted absence of coherence shifts for non-discriminating cues and a negative correlation between absolute coherence shifts and initial cue validity, but no effect of the deliberation manipulation on coherence shifts. This work informs process-level accounts such as PCS-DM and the MCD model of how and when cue weights are reshaped during choice.

Keywords: decision making, coherence shifts, probabilistic inference, subjective cue validity, parallel constraint satisfaction

Investigating the Integration of Artificial Filter Information in Face Representations: Using the Face Adaptation Paradigm

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To recognize familiar faces despite their continuous changes, such as those caused by aging or varying lighting conditions, the human face memory must remain flexible. This flexibility is achieved through the continuous updating of existing memory representations of faces. On social media platforms, online users consume facial changes through artificial filters that smooth the skin, homogenize faces, or enhance contours and details. Our research investigates whether such artificial filter information, e.g., blurring and sharpening filters, can be integrated into mental face representations, thereby updating and becoming part of the face memory. The findings are based on two experimental studies conducted and interpreted within the framework of the face adaptation paradigm. In the first study, viewing strongly blurred faces led to subsequent perceptual distortions: participants judged slightly blurred versions significantly more often as “unchanged” or “natural” compared to a control group, indicating an updating and integration of this information into the existing face representation. A second study examines the temporal stability of such changes over a five-minute interval to determine whether artificial filter information can induce not only short-term perceptual but also long-term and representational changes in face memory. Preliminary analyses show that the change in facial perception caused by artificial filters does not last five minutes, suggesting that such effects are rather short-lived updates of face memory representations.

Keywords: face representations, face adaptation, face perception, face memory, artificial filter information, blurring and sharpening filters, social media

Neural Correlates of Object Recognition in Simulated Natural vs. Urban Environments

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In this study we investigated the neuro-cognitive mechanisms of "green exercise benefits" by examining how natural versus urban virtual environments affect peripheral visual object recognition and perceived exertion during movement.

Thirty participants (age = 27.30 ± 4.20 , 8 females) performed an object detection task (identifying birds, traffic signs, or control stimuli) while seated or walking in VR-simulated nature (forest) or urban (city) settings. A 64-channel mobile EEG system was used to record neural activities during the object recognition task. Event-related potentials (ERPs), time-locked to the object onset, were computed and compared among the different objects, environments, and movement conditions. Behaviorally, reaction times showed significant main effects of movement, $F(1,29)=10.83$, $p < 0.01$, partial $\eta^2=0.030$, environment, $F(1,29)=6.24$, $p < 0.05$, partial $\eta^2=0.060$, and stimulus type, $F(1,29)=14.95$, $p < 0.001$, partial $\eta^2=0.140$. Reaction times were faster during walking versus sitting, in urban versus natural environments, and for traffic signs versus other stimuli. A significant movement $\times$ environment interaction, $F(1,29)=9.3$, $p < 0.01$, partial $\eta^2=0.010$ revealed slower responses when walking in nature compared to other conditions, despite improved perceived exertion and spatial satisfaction. Neurophysiologically, movement showed a strong main effect, $F(1,29)=68.11$, $p < 0.001$, partial $\eta^2=0.700$, with enhanced P300 amplitude during walking, particularly over posterior areas. Control stimuli elicited smaller P300 responses than other stimuli. The results suggest that natural environments specifically enhance perceptual experience during movement, aligning with green exercise benefits, while locomotion itself modulates attentional resource distribution.

Keywords: Object recognition, EEG, Event-Related Potentials, Movement, Green exercise

The physiological background of emetophobia: The role of disgust as a threat signal

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Emetophobia is a specific phobia characterized by an intense fear of nausea and vomiting. Emetophobic individuals interpret disgust sensations as threatening stimuli [AZ1] [AZ2] during as a sign of impending vomiting, which triggers increased anxiety, thereby increasing their arousal levels. Disgust plays a crucial role in both the development and the maintenance of emetophobia. Contamination sensitivity offers a relevant framework for understanding the association between emetophobia and disgust: contact with objects perceived as having a high potential for contamination may be experienced as threatening by emetophobic people. In our study, we investigated the physiological responses relevant to emetophobia elicited by disgusting stimuli. Within our experimental model, we used disgust as a threat-related stimulus, given its central role in the development of specific phobias including emetophobia. Participants ($N = 40$) completed the EmetQ-13 and the SPOVI questionnaires assessing emetophobia severity. Subsequently, they viewed either a 10-minute neutral or a disgust-inducing video. During the vide, we measured skin conductance and heart rate variability to detect increases in arousal level. Our findings suggest that the manipulation was successful, participants exposed to disgusting stimuli reported higher levels of disgust. More importantly, an intense fear of vomiting is associated with heightened arousal responses as evidenced by faster skin conductance responses (SCR) and higher heart rate variability. Participants reported higher level of disgust based on their subjective ratings, this was also reflected in the physiological measures. These findings highlight the clinical relevance of disgust in emetophobia and underscore the importance of considering this association when developing therapeutic protocols.

Keywords: emetophobia, skin conductance response (SCR), heart rate variability (HRV), disgust

Skin conductance responses to physiological arousal elicited by threatening stimuli during a visual search task

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Threatening stimuli influence visual attention by distracting from the task at hand and enhancing performance. However, the underlying mechanisms remain poorly understood. The arousal stimulation effect suggests that, while threats initially capture attention, high arousal levels may subsequently facilitate attentional processing. Our study investigated this proposition using a visual search paradigm alongside electrodermal activity recordings. Participants performed a number matrix search while task-irrelevant images of varying emotional intensity (neutral, medium-arousal threat and high-arousal threat) appeared in the periphery of their vision. We analysed reaction times reflecting early and sustained attentional processing, and we recorded skin conductance responses (SCRs) to gauge physiological arousal. Behavioural data revealed that medium-arousal threat images impaired overall search efficiency, whereas high-arousal threats initially slowed performance but ultimately improved continued search efficiency. Physiologically, high-arousal stimuli prompted faster and greater SCRs than medium-arousal and neutral stimuli. No notable differences in SCRs emerged between medium-arousal threat images and neutral images. These results provide direct physiological support for the arousal stimulation effect, revealing a non-linear interaction between arousal intensity and attentional function. Our work emphasises the critical roles of arousal magnitude and timing in modulating attention in response to emotional stimuli.

Keywords: visual search, physiological response, emotional distraction, threat effect, attentional control, attentional biases for threat

Emotional Distraction and Cognitive Control: Investigating the Effects of Negative Life Events Using a Number Matrix Paradigm

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Previous research has shown that chronic stress resulting from negative life events (NLEs) impairs prefrontal cortex functioning, leading to weakened inhibitory control, working memory overload, and attentional bias toward event-related stimuli. Our proposed study investigates how traumatic event-related visual stimuli influence performance in a visual search task compared to neutral stimuli. Participants will complete a Number Matrix Task in which they must sequentially click numbers 1-10 within a random array containing numbers up to 35, while distracting visual stimuli will appear. Five categories of negative stimuli will be used (e.g., death, extreme injury/illness, violence). Neutral stimuli will be matched in content but non-negative. Performance will be assessed via two reaction time measures: (1) time to locate the number 1 after stimulus onset, reflecting attentional orienting; and (2) time required to progress from 1 to 10, reflecting attentional control and working memory load. Participants will also complete questionnaires assessing psychological state, individual characteristics, and the occurrence of NLEs. Data will be analysed using linear mixed models with reaction time measures as outcome variables (separately), stimulus valence (negative, neutral) and category as within-subject factors, questionnaire scores as independent predictors, participant ID as a random factor. We hypothesize that negative stimuli will slow performance relative to neutral stimuli, and that individuals reporting more NLEs or heightened emotional distress will show stronger interference effects. This paradigm may provide insight into how NLEs and related emotional cues disrupt cognitive control, offering a useful experimental model for studying cognitive-affective mechanisms underlying attentional disturbances following adverse experiences.

Keywords: negative life events, cognitive control, emotional distraction, working memory, attentional interference, visual search task

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