

TeaP@Home 2021

Abstracts

of the 63rd Conference of Experimental Psychologists

edited by Anke Huckauf, Martin Baumann, Marc Ernst,
Cornelia Herbert, Markus Kiefer, Marian Sauter

March 14 - 16, 2021

Ulm, Germany

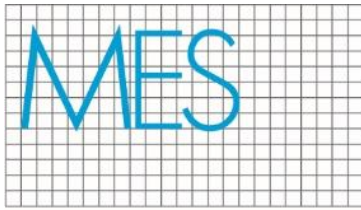
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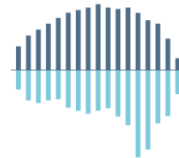


Fachgruppe Allgemeine Psychologie



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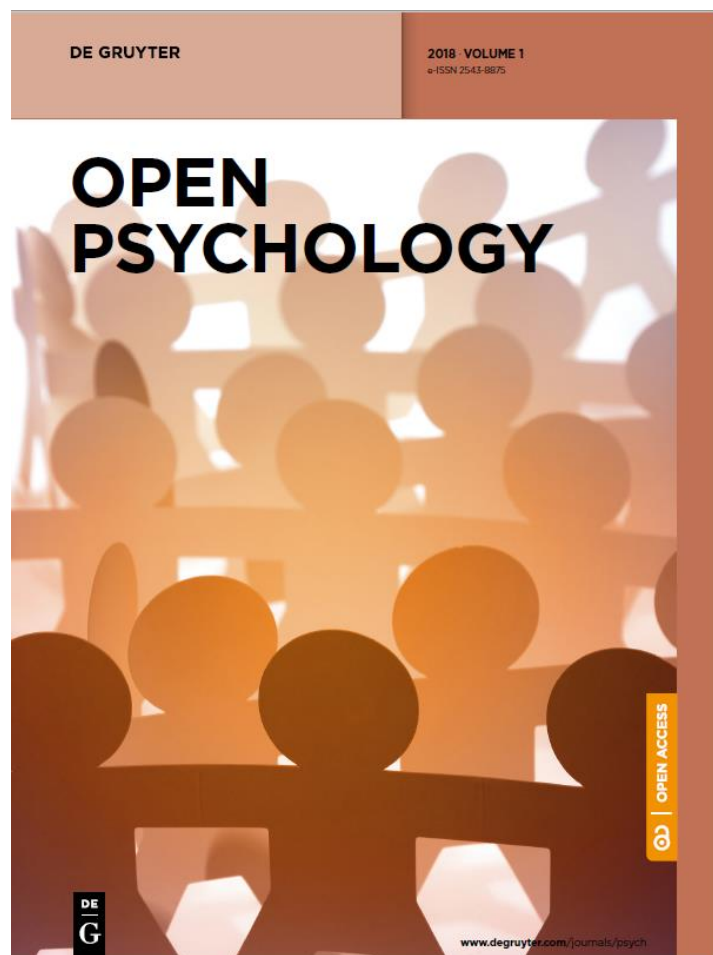
LABVANCED



Participant Pool Management Software



DE GRUYTER



Organizers Note

Great things we would like to write about and show: the Ulm Cathedral, for centuries and still the highest church tower in the world, drowned by stubborn Swabians; Albrecht Ludwig Berblinger, the tailor of Ulm, who at the beginning of the 19th century succeeded in the first attempts at gliding, only to fall shamefully into the Danube in front of the king later; the highest university in Germany; we would even say a word about the Ulm fog.... Instead, we welcome you at your home for TeaP@Home, the first online TeaP, a conference in the midst of a pandemic time. After TeaP 2019 in London and the 2020 cancellation in Jena (because of the pandemics), the third extraordinary TeaP will start this year, the TeaP@Home.

We are pleased to offer an opportunity for professional exchange and personal meetings with the TeaP@Home online conference. Even though we as organizers would much rather welcome all participants directly in Ulm in presence, we, quite Swabian, save the hugs for the coming years and appreciate what we have.

More than 500 scientific contributions show that, despite the adverse circumstances, we are all carried by hope; hope for exchange, for insights, and also for continuity of our renowned, traditional, and internationally visible symposium. This is shown not least by the many contributions from non-European countries.

Some of our respected colleagues are no longer with us; first and foremost, we would like to mention Dirk Vorberg, who as a permanent guest of the TeaP, founding member of the General Psychology Section and an enthusiastic supportive companion and ambassador of highly qualified German-language psychology also contributed to the international reputation of our research community. Dear Dirk: we will for sure remember you.

The organization of TeaP has formed us here in Ulm; into a collegial team, whose regular exchange we already miss. We hope that a part of this community experience will come through to all conference participants with TeaP@Home. TeaP is one of the rare opportunities enabling us organize a conference without the formal shackles of an organization that also has to finance itself. Thank you all for your loyalty and let us preserve this rare plant.

We wish you much inspiration and joy at TeaP as you share your discussions about the scientific questions of the day in experimental psychology. To ensure that this enjoyment is promoted and not hindered by the conference technology, our team will support you the best we can.

Ulm, February 2021

Anke Huckauf, Martin Baumann, Marc Ernst, Cornelia Herbert, Markus Kiefer, Marian Sauter

Welcome Note of the President of Ulm University

It is my pleasure to welcome you at the 63rd Conference of Experimental Psychologists (TeaP). Due to the restrictions of the Covid 19 pandemic the organizers decided to hold TeaP 2021 as virtual conference following the slogan "TeaP@Home". I consider this a wise and reasonable step as our health and avoiding further spreading of the Corona virus are of highest priority.

TeaP serves as a platform for exchange in relevant academic topics and shall strengthen the collaboration of academics and their institutions. Your virtual presence and contributions will inspire the conference; let us look forward to interesting talks, facts and findings in different aspects and developments in your fields of expertise. As President of Ulm University I feel very honoured and proud that Ulm University was chosen to host such an important and traditional conference with its very interesting and attractive program. My special thanks are dedicated to the TeaP 2021 coordination team, which made this conference possible.

Even though you will not attend in presence to get an on-site impression please allow me some information and remarks about Ulm University and its Institute of Psychology and Education. Founded in 1967 Ulm University comprises four faculties with subjects such as Medicine, Natural Sciences, Engineering, Computer Science, Mathematics and Economics and Psychology of course. Ulm University is an internationally recognized research university with an excellent reputation for innovative interdisciplinary research and successful training under the guideline „Crossing Borders“. Ulm University is the center of and driving force behind the Science City of Ulm, a dynamically growing research environment divided into several business parks including hospitals, technology companies and applied research institutes. The integrative discipline of psychology plays a central role in our interdisciplinary network with various internal and external cooperations in a strong scientific environment. With its foundation in 2009 our Institute of Psychology and Education is one of the youngest in Germany. It has developed very successfully and established itself as a main player with interconnections to other disciplines and to strengthen important research foci like Human Technology Interaction or Medicine. The Psychology Department enriches the range of strategic research and development areas and offers very attractive study programmes for highly motivated students and early career researchers.

As you might know, Ulm is the town with the highest church spire, the "Ulmer Münster", in the world with traditions dating back to medieval times. Ulm is the birthplace of one of the most famous scientists ever, Albert Einstein. Ulm is also the region where the worldwide eldest human artwork has been created, the so called "lion man". I very much encourage you to visit Ulm and its university in later (and better) times to enjoy direct contact with your colleagues here and to get an own experience of the sights and attractions "in Ulm, um Ulm und um Ulm herum".

I wish you an interesting and fruitful TeaP@Home !

A handwritten signature in blue ink, appearing to read "Michael Weber", with a stylized, flowing script.

Prof. Dr.-Ing. Michael Weber
President
Ulm University

Schedule Overview

start Sunday, March 14		start Monday, March 15	start Tuesday, March 16
		08:00 Welcome	08:00 Long Talks (Long Session)
		08:15 Symposia / Long Talks	
		09:15 Symposia / Long Talks	09:15 Symposia / Long Talks
		10:15 Break / Social	10:15 Break / Social
		10:30 Short-Talk Presenters Available	10:30 Short-Talk Presenters Available
		11:00 Short-Talk Presenters Available	11:00 Short-Talk Presenters Available
		11:30 Keynote Natalie Sebanz	11:30 Keynote Helge Ritter
		12:30 Break / Social	12:30 Break / Social
		12:45 Special Lunch Session	12:45 Special Lunch Session
		13:45 Symposia / Long Talks	13:45 Symposia / Long Talks
		14:45 Symposia / Long Talks	14:45 Symposia / Long Talks
		15:45 Break / Social	15:45 Break / Social
		16:00 Symposia / Long Talks	16:00 Symposia / Long Talks
		17:00 DGPs AP Fachgruppe	17:00 Keynote Marisa Carrasco
18:00	Begrüßungsabend (open end)		18:00 DGPS AP Posterprize
19:00	Memorial Meeting in honour of Dirk Vorberg	18:30 Social (open end)	18:30 Closing Farewell (open end)

The detailed program can be found here: <https://www.conftool.com/teap2021/sessions.php>

Keynote Talks



Minds in Joint Action

Natalie Sebanz

Social Mind Center, Central European University Budapest, Hungary

Humans are able to perform a wide range of joint actions, from carrying heavy objects together to having conversations. What are the mechanisms enabling joint action? And what can they tell us about the human mind?

This talk will provide an overview of experimental research that has begun to unravel the behavioural, cognitive, and neural processes supporting our ability to act together. In the first part, I will discuss which aspects of others' actions and tasks are included in our planning and how forming joint action plans facilitates coordination. In the second part, I will focus on coordination mechanisms operating during performance that range from making oneself more predictable to forming partner-specific predictions. Recent work on how trust affects interpersonal coordination, and how coordination affects our perception of others will also be discussed.



From disembodied AI to embodied learning

Helge Ritter

Center for Cognitive Interaction Technology (CITEC) and Faculty of Technology, Bielefeld University

We are currently witnessing amazing progress in the field of AI, enabled through a convergence of advances in machine learning, computing resources and availability of huge data sets for training. This has allowed to solve with computers an unexpected row of challenges that in former years were considered as the hallmarks of human cognition. While the achieved break-throughs are impressive, they on the other hand appear largely focused on tasks for which physical embodiment is either absent, weak or can be circumvented, e.g. through simulation. Only very recently deep learning techniques have been demonstrated to be also capable of learning intricate embodied interaction skills, such as manipulating an object. However, the employed deep learning methods required the equivalent of millennia of interaction years for a task that is well within the realm of our normal, daily sensori-motor skills.

This striking "parsimony gap" between current machine learning methods and embodied human learning raises the question: is embodiment an important element for arriving at different, more parsimonious learning approaches? Comparing current deep learning and embodied/natural learning approaches, we argue that embodiment becomes a crucial factor when learning involves physical interactions.

Looking at research examples from robotics and human studies, we take a tour through important "ingredients" of embodied learning and show how embodiment frequently is tightly interwoven with the learning of flexible interactions. Examples include to learn about touch and contact, cope with and exploit elasticity, or utilize strong priors, for instance in the form of situation models that link perception, memory and action in generic and structured ways that reflect natural regularities in the world. We conclude with an outlook on how to weave these research directions together towards bridging the gap between current, disembodied AI learning methods and the flexibility and parsimony of embodied learning as we find it in natural learning agents.



Attention shapes perception

Marisa Carrasco

Psychology and Neural Science, NYU

Visual attention is essential for visual perception. Spatial attention allows us to grant priority in processing and selectively process information at a given location.

In this talk, I will present: (1) psychophysical experiments investigating how endogenous (voluntary) and exogenous (involuntary) covert attention improve contrast sensitivity at attended locations while differentially affecting spatial frequency; (2) neuroimaging (fMRI) experiments differentiating effects of endogenous and exogenous attention on occipital cortex; (3) a neurostimulation experiment establishing that transcranial magnetic stimulation (TMS) on occipital cortex extinguishes the effects of exogenous attention. Together these studies reveal how endogenous and exogenous attention shape perception by altering the processing of basic visual dimensions.

Special Lunch Sessions

I want it all! Wie vereinbaren Frauen in der Allgemeinen Psychologie Karriere- und Kinderwunsch?

Carina G. Giesen, Anke Huckauf & Ute J. Bayen

Das Ende der Promotion ist in Sicht, aber wie geht es weiter? Will ich eine Karriere in der Wissenschaft und eine Professur anstreben? Oft sind es gerade junge Frauen und Nachwuchswissenschaftlerinnen, die bei einer Antwort auf diese Frage zögern. Die Gründe dafür sind vielfältig: Viele Forscherinnen können sich eine Karriere in der Wissenschaft durchaus vorstellen, haben aber gleichzeitig den Wunsch, eine Familie zu gründen und Kinder zu bekommen. Ist eine Karriere in der Wissenschaft mit meinem Kinderwunsch vereinbar? Gilt das auch für Frauen? Schaffe ich es, mich um meine Forscherinnenkarriere zu kümmern, wenn ich Mutter bin? – Wir alle wissen, dass die Antwort darauf „Ja! Natürlich!“ lauten muss; was einem jedoch keine/r sagt, ist: Wie kann das gelingen?

In diesem Diskussionsforum berichten Ute J. Bayen (Professorin für Mathematische und Kognitive Psychologie, Universität Düsseldorf, Mutter von zwei Kindern), Anke Huckauf (Professorin für Allgemeine Psychologie, Universität Ulm, Mutter von zwei Kindern) und Carina G. Giesen (Akademische Rätin a.W., Allgemeine Psychologie, Universität Jena, Mutter von drei Kindern) von ihren Erfahrungen zum Thema Vereinbarkeit von Familie und Karriere.

Wir wollen aufzeigen, welche individuellen Möglichkeiten und Wege es für Frauen gibt, Karriere- und Kinderwunsch zu vereinbaren.

Wir freuen uns auf eine Diskussion und einen Erfahrungsaustausch mit interessierten Nachwuchswissenschaftlerinnen (Doktorandinnen in der Endphase ihrer Dissertation, Postdoktorandinnen und Juniorprofessorinnen).

Um ein Gespräch und einen Erfahrungsaustausch zu ermöglichen, ist die Zahl der Teilnehmerinnen begrenzt auf 30 Personen.

Behavioral Online Experiments: New Mainstream or Short-Term Trend?

Marian Sauter

There has been a steep rise in behavioral online experiments; a rise that is fueled by the Covid-19 pandemic. Will researchers only resort to online experiments because they have no other choice? Once labs will open and student participants get back to the Universities – will there be steep decline again? Or is global lab-closure a chance for researchers to globally acknowledge benefits of online experiments as a steady method on par with lab-based studies? In this moderated panel discussion, our guests will talk about benefits and shortcomings of online experiments and share their personal experience on conducting, reviewing and editing behavioral online research.

We are honored that we were able to attract a global panel of researchers. Our already confirmed panelists are Ayanna Thomas (Prof. at Tufts University & President of the SPARK Society), Elisa Filevich (PI at BCCN Berlin & Developer of JATOS), Isabel Gauthier (Prof. at Vanderbilt University & Editor-In-Chief at JEP:HPP), Jonathan Tsay (Ph.D. candidate at UC Berkeley) and Ulf-Dietrich Reips (Prof. for iScience at Univ. Konstanz). The discussion is moderated by Dejan Draschkow (PostDoc at Oxford University & Lecturer at St. John's College) and hosted by Marian Sauter (PostDoc at Ulm University).

All attendees are invited to ask questions to enrich the discussion.

Contributions

Expectancy and Attention Bias in Phylogenetic vs. Ontogenetic Stimuli

Elinor Abado¹, Tatjana Aue, Jan De Houwer, Hadas Okon-Singer

¹*School of Psychological Sciences, University of Haifa, Israel; elinora18@gmail.com*

Background: Previous studies found that attention bias (AB) to spiders is immune to the effects of a-priori expectancies, while neutral stimuli are affected by expectancies. Mixed results exist regarding expectancies and AB in phylogenetic (e.g., spiders) vs. ontogenetic (e.g., guns) stimuli. The aim of the current studies was to directly compare AB between phylogenetic and ontogenetic stimuli.

Method: Expectancies were manipulated by presenting a cue indicating the likelihood of the appearance of a deviant picture in a visual search array. The array included 8 distractors and one neutral (phone/bird) or threatening (gun/spider) deviant picture presented on a white or a complex background. Experiment 1 (n=120) included only valid and invalid cues. Experiment 2 (n=160) also included ambiguous cues and the array was presented for a longer duration.

Results: In both experiments, consistent AB was found toward spider targets, but not toward gun targets. In Experiment 2, AB toward spiders was correlated with fear levels. In ontogenetic conditions, participants used cues to detect deviants to a larger extent, compared to phylogenetic conditions.

Discussion: These results suggest a dissociation in AB toward phylogenetic versus ontogenetic stimuli. Compared to phylogenetic stimuli, AB in ontogenetic stimuli is reduced, as expectancy cues are used more often. Only in ontogenetic conditions, AB varies between experiments and conditions. Additionally, compared to phylogenetic stimuli, attention in ontogenetic stimuli is influenced by background types to a larger extent.

Social influences on memory: One paradigm to examine them all?

Magdalena Abel¹, Karl-Heinz T. Bäuml

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Humans as social beings constantly interact with one another. How input from social sources affects individual memory has previously been examined, but the corresponding literature seems to be separated into different areas, concerned with single effects only. We present a novel recognition-based collaboration task that allows the simultaneous examination of several social influences on memory. Participants are tested in groups of three. An initial study phase is completed individually, with some information being studied by all group members, while other information is studied by two or single group members only. On a subsequent collaborative or individual recognition test that probes memory for the study phase, subjects are presented with all old information, mixed with new information. To examine how collaboration on this task affects individual memory, all subjects are asked to complete a final individual recognition test. Three main findings emerge. First, for initially studied information, collaboration with others benefits individual memory, likely by providing an opportunity for re-exposure. Second, for information that was initially studied by one or both other members of the group, collaboration distorts individual memory, with subjects incorporating the information into their own memory. Third, collaboration makes memories across group members more similar, resulting in higher proportions of memories that are collectively shared by all group members. We outline ways in which our new recognition-based collaboration task may help to gain a more holistic understanding of social influences on memory.

An analytic cognitive style negatively predicts a more literal but not a more symbolic religiosity type

Luz Ailén Acera Martini¹, Esteban Freidin

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The idea that a more analytic cognitive style is associated with lower religiosity is a theoretical prediction that has been challenged by some empirical findings. We conducted three studies with Argentine participants (N=719) to clarify this issue. In Study 1, we replicated the negative correlation between analytic cognitive style, measured with the Cognitive Reflection Test, and Belief in Supernatural Agents, Intrinsic, and Intuitive Religiosity. In Studies 2 and 3, participants responded to the Post-Critical Beliefs Scale which measures both the presence of a transcendent dimension in beliefs and the extent to which literal-vs.-symbolic beliefs are endorsed, and we also tested for individual differences in Need for Cognitive Closure. Results showed that a more analytic cognitive style negatively predicted both inclusion of transcendence and a literal interpretation of religious ideas. Moreover, an analytic cognitive style was negatively associated with a literal but not with a symbolic inclusion of transcendence in beliefs. In turn, higher scores of closed-mindedness were positively associated with a more literal interpretation of religion. We conclude that present data support the hypothesis that religiosity may be negatively associated with an analytic cognitive style, but individuals who experience religion more symbolically do not accommodate to that pattern.

Does negation influence the choice of sentence continuations? Evidence from a four-choice cloze task

Elena Albu¹, Carolin Dudschig, Tessa Warren, Barbara Kaup

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In four behavioral experiments, we investigated how negation influences the choice of sentence continuations that differ with respect to whether or not they involve world knowledge or semantic violations. In a four-choice cloze task, participants saw sentence fragments (The child will (not) eat the ...) in combination with four alternatives: expected (yoghurt), weak world knowledge violating word (shellfish), severe world knowledge violating word (branch) and semantic violation (minivan). In the affirmative condition people are expected to choose the expected word. In the negative condition, participants could interpret negation in a logical way, which would not lead to any differentiation between the four choices. Alternatively, participants could opt to interpret negation based on the plausibility of the event described: either as the denial of the most plausible event (The child won't eat the yoghurt) or as the description of the most plausible negative event (The child won't eat the shellfish).

The results showed that the expected word was highly preferred in both polarity conditions, indicating a tendency for negation to be interpreted as the denial of the most plausible event (The child won't eat the yoghurt). The possibility that negation was not fully integrated in the sentence meaning was ruled out (Experiment 2) as well as the possibility that the choices were driven by lexical associations (Experiment 3). Experiment 4 showed that the observed plausibility effects can be generalized to other aspectual forms (The child has/hasn't eaten the yoghurt).

Naturalistic Stimulation in M/EEG: Promises and Pitfalls

Phillip M. Alday¹

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Naturalistic auditory and even audiovisual stimulation in fMRI has been an established method for nearly 15 years. Meanwhile, only a handful of M/EEG studies have used such naturalistic stimuli to study complex cognitive phenomena (e.g. language instead of speech, cf. Alday 2019). The high temporal resolution of M/EEG works as a double-edged sword, opening up the fine structure of cognition to study but also creating massive challenges due to the temporal variability of naturalistic stimuli. As an example, words such as "red" and "yellow" are broadly speaking quite similar, yet differ in temporal extent by around 200ms, which is no problem for fMRI but traditionally thought of as catastrophic in electrophysiology. I will demonstrate several ways of dealing with variability in temporal duration, based on recent successes in the literature (Alday et al. 2017, Broderick et al., 2018, Brodbeck et al. 2018, Hale et al. 2019) and discuss the tradeoffs inherent in each approach. I will highlight especially how the combination of signal processing, aggregation and statistical technique influence which inferences are possible without creating a single gold standard. I will conclude by examining why it is so important to further develop these techniques and suggest several key areas for future study.

A multi-dimensional approach to measuring automatic appraisals.

Daria Altenburg¹, Adriaan Spruyt

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Past research has demonstrated the important influence automatic appraisals have on a wide range of behaviours, including social interactions, risk taking, consumption choices, and addiction. Despite this evidence, the precise nature and magnitude of these influences have been obscured by inconsistent findings. Here we propose that this ambiguity is, at least in part, due to the unidimensional and/or generic nature of discriminations used in common approaches for assessing automatic appraisals. Instead, we argue that the further improvement of behavioural models and interventions requires a more nuanced approach that takes into account the multidimensional nature of stimuli and the degree to which specific stimulus dimension are goal-relevant. As such, the goals that motivate individuals can vary greatly and drive the degree to which attention is directed at certain stimulus features. Importantly, recent research consistently finds that automatic appraisals are largely dependent on such top-down attentional control. The more attention is assigned to one stimulus attribute, the higher the likelihood that it will be processed under automaticity conditions. However, the degree to which existing measures of automatic appraisals can take into account such individual variation is greatly limited. We introduce the Implicit Attribute Classification Task (Spruyt & Altenburg, 2019), which can record several automatic appraisals simultaneously by switching between evaluative and non-evaluative classification trials of target-attribute pairs. This methodological advance has crucial implications for both the interpretation of existing research and design of future research.

Prospective Memory: Between fundamental and applied research

Mareike Altgassen¹

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The human ability to remember and implement an intended action at the appropriate time in the future is referred to as prospective memory. This symposium will take both, a fundamental and applied research perspective. We will present experimental studies that contribute to a better understanding of the cognitive, emotional and motivational foundations of this ability. On the other hand, applied questions such as deficits in prospective memory in everyday life, in depression or in old age will be addressed. In the first contribution, Schaper et al. examine the extent to which prospective memory can be understood as an evolutionary-adaptive cognitive function. To this end, the authors test whether intentions that relate to fraudulent or cooperative people have a higher probability of execution than those that relate to neutral people. Emotional factors on prospective memory are the focus of the second talk in which Duffek et al. examine how depression-related emotions affect memory performance. The third contribution by Altgassen et al. is dedicated to the question if shared prospective intentions lead to better intention execution than individual intentions and if performance is influenced by motivational factors. The fourth talk by Horn and Freund also investigates motivational influences on prospective memory. They test whether the negative consequences of memory failure or the positive consequences of successful memory performance differentially impact prospective memory performance and whether these effects are age-dependent. The fifth talk by Kliegel and Haas examines prospective memory performance of younger and older adults in everyday life with the help of a diary and ambulatory assessment. Finally, the results of the individual contributions are summarized and discussed by J. Rummel.

With (or without) a little help from my friends: The impact of collaboration versus punishment on prospective memory performance of groups

Mareike Altgassen¹, Ann-Lisa Cohen, Michelle Jansen

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The ability to remember to execute delayed intentions is called prospective memory. In everyday life there are many situations in which delayed intentions are shared by more than one person. Surprisingly, however, there are hardly any studies that investigate prospective memory performance in social settings. The aim of this study is to investigate whether the possible consequences of one's own behavior have an impact on event- and time-based prospective memory performance in different group settings. A total of 207 people took part in this study. They were randomly assigned to an individual, collaborative, or collaborative plus punishment condition and tested in either a 2 or 3 person setting. The statistical analyzes for the time-based prospective memory task indicate that participants responded less accurately in the individual condition, whereas there were no differences between the two collaborative conditions. In the event-based prospective memory task, there were no significant effects of motivational conditions or group size. Analysis of ongoing task performance showed that participants varied their focus of attention depending on their prioritization of ongoing and prospective memory tasks.

Logging application content and active user interaction on Android smartphones

Ionut Andone¹, Konrad Blaszkiewicz, Qais Kasem, Alexander Markowetz

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Smartphones are an integral part of our daily life. They are the trusty companion that helps us communicate with our peers, catch up with the latest news, do the shopping and pay for it, navigate the city, and many more daily tasks. This behavior can be observed up to some level of accuracy. Until now, researchers could log what apps are being used but not for which purpose. This information could be retrieved from the user through ESM/EMA at the time or after usage. However, these methods are prone to bias and the collected data can be subjective. Automatic recording of the user behavior inside apps brings objective assessment into the world. Researchers can observe if the user is actively interacting in an app by writing comments and liking posts, or if he is just consuming content passively by scrolling aimlessly. The interests of the users can be better mapped when using portal type apps which offer a wide variety of content. The type will describe his actions better than just observing the usage of a specific app. Certain game theory scenarios could be tested in real life situations without influencing the user in any way. Choosing a mean of transport is influenced by a multitude of factors with price playing a big role. Analyzing application content and the associated user interaction could lead to a new wave of research and experiments that was not possible before.

The impact of enhanced GABAergic signaling on response inhibition and conflict adaptation

Eduardo Aponte¹, Kaja Faßbender, Ulrich Ettinger

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Adaptive behavior entails not only stopping stereotypical actions but also starting new plans that answer changing circumstances. Response inhibition -the faculty to stop actions triggered by exogenous cues- allows the flexible interplay between bottom-up, stimulus driven behaviors, and top-down strategies. In addition to response inhibition, high conflicting situations and the ensuing increment in cognitive control trigger conflict adaptation, reflected in the slowing of bottom-up responses and the facilitation of top-down actions. It is currently not well understood whether response inhibition and/or conflict adaptation are mediated by GABAergic signaling, the main inhibitory neurotransmitter in the human brain. Here, we investigated how lorazepam, a positive allosteric modulator of the GABA_A receptor, affects response inhibition and conflict adaptation in the Simon and antisaccade tasks. Fifty healthy adults participated in a randomized, double-blind, placebo-controlled study. Every participant received a placebo, 0.5mg and 1.0mg of lorazepam over 3 different visits, in which both tasks were administered in pseudorandomized order. To estimate the effect of lorazepam on response inhibition and conflict adaptation, we used a computational model fitted to trial-by-trial reaction times of correct and erroneous responses. Lorazepam impaired response inhibition by increasing the number of inhibition errors in the antisaccade and Simon tasks. However, our computational analysis demonstrated that lorazepam facilitated conflict adaptation in the Simon task, as shown by the slowing of congruent responses following high conflict trials. Hence, our study provides evidence that boosted GABA-A signaling improved conflict adaptation while impairing response inhibition.

The role of action-specific predictions on perception

Belkis Ezgi Arikan¹

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Action-specific predictions are essential for successful human interaction. They are highly robust, yet subject to constant updating as context and goals change. The aim of this symposium is to discuss recent findings from behavioral and neuroimaging studies that investigate how goal-related and environmental factors modulate action-specific predictions. Jakub Limanowski will present behavioral and fMRI evidence on the role of precision assigned to sensory information in representing upper limb movements. Dimitris Voudouris will talk about the role of action-specific predictions and feedback signals on somatosensory suppression during goal-directed hand movements. Bianca van Kemenade will discuss whether discrete or continuous sensory feedback yields differences in predicting and monitoring action-feedback contingencies. Ezgi Arikan will address adaptation of motor and sensory predictions to temporal lags of action-feedback pairs. Finally, Clare Press will give an overview of recent fMRI and psychophysical work from her lab to address inconsistencies between predictive perception and sensory cognition literature.

Organizers

Belkis Ezgi Arikan & Katja Fiehler

The role of motor-sensory and inter-sensory components in motor-sensory recalibration

Belkis Ezgi Arikan¹, Bianca M. van Kemenade, Katja Fiehler, Tilo Kircher, Knut Drewing, Benjamin Straube

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Adaptation to systematic temporal lags between our actions and their sensory feedback is known as motor-sensory recalibration. The exact mechanism underlying motor-sensory recalibration remains to be investigated. First, the contribution of efferent vs. re-afferent feedback needs to be examined. Second, it is not clear whether recalibration is present only for the adapted sensory modality or whether it transfers across senses. In this study, we investigated the role of efferent vs. re-afferent feedback on motor-sensory recalibration, and whether it transfers across sensory modalities. Participants initiated button presses triggering an auditory or a visual stimulus that was either presented immediately or lagged in time (150ms). The button was pressed by the participant either actively or passively by a passive movement device (passive button). The participants were then asked to detect variable delays between the button presses and the subsequent sensory feedback. The test stimulus could be either within the recalibrated modality or the other modality (cross-modal). We found motor-sensory recalibration within the adapted modality irrespective of the type of sensory feedback when the movement during recalibration was active. For passive movements, recalibration was present only for the visual modality. Our results show motor-sensory recalibration within the adapted sensory modality highlighting the importance of learned action-feedback associations. Although efferent feedback alone does not seem to drive motor-sensory recalibration, our results demonstrate stronger motor-sensory recalibration effects when efferent feedback is present.

Investigating Effects of a n-back Task on Decision-Making using Eye-Tracking in a Driving Simulator

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We report results of an exploratory eye-tracking study in which participants were driving in a simulator and had to periodically merge at an intersection with oncoming traffic. In parallel they performed a working memory task that was designed to induce cognitive load (WML), at low or high working memory load levels (form of either a 0-back or 2-back task respectively). Previous studies have shown that task-evoked pupillary responses (TEPRs), changes in pupil size, correlate with changes in cognitive processing demands, including WML. The magnitude of this change is a reliable indicator of cognitive load. During the driving phase we found TEPRs in response to the WML task, that had on average greater pupil sizes for the 2-back condition compared to the 0-back condition. During the decision to merge at the crossing we found two significantly different types of TEPRs across participants and the magnitude in pupil size change during decision making is positively correlated with the probability of making mistakes in the working memory task. These effects may reflect different strategies in managing cognitive resources available for the parallel decision making and memory tasks. We also found that fixation and saccadic scan patterns just before the decision to merge differed between WML conditions. Driving behavior did not show differences over WML conditions. Our results suggest that eye-tracking and pupillometry may provide a sensitive probe to observe covert strategies to cope with changing cognitive demands in realistic multi-tasking as it occurs during driving.

Overshadowing in Contingency Learning and Stimulus-Response Binding and Retrieval

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Storage and retrieval of episodic stimulus-response (SR) bindings are core mechanisms of action regulation. As they constitute memory traces based on past experiences, one could argue that these transient bindings might have implications in learning. Yet, it is an unresolved issue how these transient SR bindings relate to longer lasting learning effects. Empirical findings are scarce and unsystematic so far. The present talk explores the relation between transient SR bindings and principles of Pavlovian Conditioning. A series of experiments addresses to which extent SR binding and learning effects reflect similar or different mechanisms. We used an overshadowing procedure to test whether transient binding effects for distractors “mimic” typical overshadowing effects, that is, whether binding effects are attenuated for a distractor presented together with another, but more salient, distractor. In the experiment, two distractors (neutral words) were presented simultaneously. Overshadowing was manipulated by using a colour contrast between the distractors such that one distractor appears more salient than the other. Furthermore, we established a contingency between the distractors and the response such that certain words were predictive for left/right key presses (75% contingency). Contingency learning for salient and nonsalient distractors was assessed. The results of this overshadowing manipulation on contingency learning effects will be discussed along with the role of Stimulus Response bindings in learning

Selective relationships between fine motor abilities and numerical abilities at preschool children.

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In this study, an experiment was conducted on 48 children, aged 5-6 years, to clarify mediation process between their arithmetical abilities and fine motor abilities. We studied whether number concepts mediated relationship between fine motor abilities and arithmetical abilities. Number concepts at young children divided into counting schema which allowed us to accurately count number and global quantity schema which allow us to adequately recognize number magnitude.

From the result of analysis, fine motor abilities were associated with arithmetical abilities by the intermediate of counting schema. If children will be able to operate the fingers properly, they will be able to correctly count the number and then improve arithmetical abilities. On the other hands, fine motor abilities were not associated with the global quantity schema. In sum, this study suggested that the relationships between fine motor abilities and number concept were selective.

Male and Female perception of virtual 3D-model: An exploratory study

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In recent years virtual reality (VR) has been of prime importance due to its interdisciplinary approach. Researchers from various disciplines have extensively implemented VR into their domain. In psychology, we see the potential use of virtual reality as an effective treatment methodology concerning various mental health problems. However, the perception of the male and female towards the virtual environment has been unaddressed. Hence, in this exploratory study, we attempted to address this issue, particularly in the perception of virtual 3D-models. We here compared the Likert 10-point rating response of both sexes. In total, 99 healthy participants were selected, and each participant was presented with 17-models, which were chosen from the Sketch-up 3D warehouse library. Both sexes were assigned five-question for each 17-model (total of 85 visual presentations). Our finding suggests a significant sex-difference in the perception of 3D-models. Further, this difference has been noticed strongly in the case of structurally significant structures. Future psychological studies with virtual 3D-model require modification for their appropriate application between different sexes. Also, researchers should give different age-groups and gender considerations.

Keywords: 3D-models, virtual-reality, sex-difference, likert-rating

The Multifaceted Determination of Cognitive and Emotional Empathy

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Research has shown that empathic responses depend on target characteristics. Little is known yet about the influence of perceived warmth and competence of a social target on different forms of empathy (i.e., cognitive and emotional). Moreover, it remains to be determined whether those factors influence empathic responding similarly for desirable and undesirable outcomes. Correspondingly, the current study investigated empathic responses in undergraduate students to four different social targets experiencing 16 desirable and 16 undesirable scenarios. Those four targets consisted of an in-group member (student) and three out-group members (elderly, businessperson, alcoholic) related to the four quadrants spanned by the two dimensions perceived warmth (low, high) and perceived competence (low, high) specified in the Stereotype Content Model. Specifically, we asked our participants to state their cognitive as well as their emotional empathy regarding all 128 situations (32 scenarios x 4 social targets) and rate the characters' warmth and competence as well as their degree of identification with the different social targets. We show that the extents of experienced cognitive and emotional empathy depend on the combination of the (a) characteristics of the social target (e.g., perceived warmth and competence); (b) valence of a scenario (undesirable, desirable), and (c) degree of social identification with the social target. Consequently, the current research highlights the multifaceted determination of empathic responding in human beings and strongly argues for an interactive view of those multiple determinants rather than treating them as independent contributors.

Self vs. Simon: On the interplay between the self and spatial cognition

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In this talk, we present evidence from two experimental lines combining spatial compatibility tasks such as the Simon task with task-irrelevant self-related stimulus material. In Experiment 1, participants responded to the color of a dot superimposed on photos of different faces (one's own, co-actor's face, stranger's face) presented on the left or right side of the screen's center. In Experiment 2, whole-body photos of different humans (one's own, stranger's photo) holding a colored ball in either hand presented on either side of the screen's center were utilized. In both experiments, the task-relevant feature required a classification based on the stimulus color whereas the stimulus location was task-irrelevant. Therefore, two kinds of compatibility effects could be considered, i.e. based on the spatial compatibility between the stimulus location and the response (i.e. the Simon Effect) and based on the compatibility between the identity of the actor on the photo and the responding agent (i.e. Photo-Agent Effect). In Experiment 1, the spatial compatibility effect was more salient than the identity-based compatibility effect. Experiment 2 found evidence for both, i.e. spatial and identity-based compatibility effects. Using both, i.e. task-irrelevant self-relatedness and task-irrelevant spatial location, shifted the cognitive weights associated with the spatial and identity-based compatibility

Visuomotor adaptation to sinusoidal perturbations: from frequency response to system identification

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Sensorimotor adaptation is the trial-and-error modification of a movement over time, driven by the mismatch between predicted and actual motor output.

The aim of our study is to identify a computational model that accounts for the characteristics of adaptation rate measured in dynamically changing environments.

The Kalman filter is a statistically optimal model proposed for adaptation (Burge et al., 2008). It predicts that the mapping between the desired goal and the motor output is updated continuously based on a weighted combination between the most recently measured error and the mapping estimated over previous trials. The weight assigned to the most recent error increases as measurement uncertainty decreases.

We evaluated the predictions of the Kalman filter model by comparing it to motor behavior in a series of rapid reaching tasks where participants had to adapt to systematic perturbations under different conditions of measurement uncertainty.

Perturbations consisted in sinusoidal offsets with different frequencies, and adaptation rate was evaluated in terms of amplitude ratio and phase shift between motor error and perturbation input. We found that adaptation measured under these conditions was not well captured by the Kalman filter model. In accordance with a growing body of research suggesting that adaptation is driven by multiple interacting but distinct processes (Huberdeau et al., 2015), we consider alternative models for adaptation that include multiple internal states, and discuss how the architecture of a system composed of multiple interacting processes can be inferred by evaluating the response to sinusoidal perturbations in the frequency domain.

Temporal Preparation Accelerates Bottom-up Processing in Visual Search – Evidence from the N1 and N2pc

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Temporal preparation facilitates selection processes in visual search. In a previous study, we observed a selection benefit for both task-relevant stimuli (i.e., the target) and task-irrelevant stimuli (i.e., a salient distractor). By means of event-related potentials, we investigate whether this non-specific benefit is due to a bottom-up enhancement of stimulus salience. Participants (N = 24) searched for a colour pop-out target amongst homogenously coloured distractors. First, we manipulated temporal preparation via a warning tone that signalled the appearance of the search display after a short or long foreperiod in separate blocks of trials (high versus low temporal preparation, respectively). Second, we manipulate the salience of the target by varying the setsize i.e. number of distractors within the search display (3 versus 19 distractors). The target-evoked N2pc as an index of spatial selection arose earlier in case of high temporal preparation (foreperiod effect) as well as in case of highly salient targets (salience effect). Most importantly, we observed an interaction between both effects: For less salient targets, the effect of temporal preparation on N2pc onset latency was more pronounced than for highly salient targets. Furthermore, this interaction was also observed for N1 offset latency. These results provide evidence that temporal preparation accelerates early visual processes via a bottom-up mechanism.

Developmental trajectories of flexible feedback processing and probabilistic reversal learning from late childhood to adulthood

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When we learn and update associations in new and changing contexts, it is important to flexibly integrate negative feedback and - at the same time – to stably retain valid associations. The developmental trajectory of processing feedback and integrating contextual information may explain the improvement in learning capacities from childhood to adulthood as well as characteristic changes in responses to feedback during adolescence. We expect learning performance and context sensitivity to increase with age, whereas adolescents should show the most flexible behaviour. Accordingly, we designed a novel experimental paradigm to investigate the degree to which children, adolescents and adults can flexibly use contextual information and feedback when adapting to contingency changes in a probabilistic reversal learning task. Based on probabilistic feedback, participants predict whether sweets, which are presented in one of two contexts, cause stomach ache or not in a fictitious group of friends. We manipulate the stimulus-outcome associations and the context throughout the experiment to measure context-(in)dependent reversal learning. Furthermore, the experimental design allows to differentiate flexible and stable responses to negative feedback. Children, adolescents and young adults between 10 and 22 years of age participate online after receiving instructions via telephone. Data collection is ongoing, but a preliminary analysis (N = 89) indicates that probabilistic learning performance is not associated with age whereas reversal learning performance increases with age and is associated with more flexible reactions to negative feedback.

The influence of expectation effects on global inhibition in motor imagery

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Motor imagery (MI) designates the mental simulation of actions without their actual execution. During MI effector-specific inhibition (inhibition of the used effector) and global inhibition (inhibition of all motor commands) prevent actual actions. Global inhibition is partly maintained over time (tonic global inhibition) and partly implemented in response to certain events (phasic global inhibition). We investigated whether tonic and phasic global inhibition are affected by expectations about the action mode (imagination or execution) of upcoming actions. Using the action mode switching paradigm participants switched between imagined and executed hand movements. In Experiment 1, the relative frequency of imagined and executed actions was manipulated. Higher tonic global inhibition in contexts with high imagination frequency indicated that it is subject to expectation effects. When tonic global inhibition was higher, phasic global inhibition and effector-specific inhibition were lower, indicating that different forms of inhibition complement each other. In Experiment 2, the predictability of the action mode of the next action (predictable vs. random) was manipulated. Phasic global inhibition was not influenced by predictability, indicating that it is not subject to expectation effects. Thus, tonic but not phasic global inhibition is modulated by expectations regarding upcoming actions.

COVID-19 vaccine: the awakening of anxiety

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In front of the pandemic situation experienced, the increase in knowledge has become central in finding solutions. This study intends to contribute to increasing the knowledge about the perception of people about the levels of anxiety regarding the development and availability of a future vaccine.

Thus, in this study, we applied the Generalized Anxiety Disorder scale (GAD-7) to evaluate the COVID-19 vaccine's anxiety disorders. We used a cross-sectional study by data collected through a questionnaire. The data were analyzed by SPSS statistical software.

When the Portuguese levels of anxiety were assessed, the results showed moderate levels. However, the Portuguese anxiety levels regarding COVID-19 have been increasing to an extremely high level, as is the case with anxiety levels regarding the future COVID-19 vaccine.

This study intends to pay attention to anxiety and the consequences of mental health. The increase in anxiety can condition not only mental health but also decision-making concerning taking the vaccine. This is an emerging problem that needs to be discussed, in order to find potential solutions for health quality improvement.

Modal and amodal cognition: Functions and interactions

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How the human mind represents the internal and external world plays a crucial role in theories of human cognition. Central to this question is the distinction between modal vs. amodal representational formats. Modal representations are experiential and are therefore rather concrete. The structure of these representations preserves the structural aspects of how we experience the world. By contrast, amodal representations resemble an abstract description of the state of affairs they represent and thus, their structure is different from the structure of their referents. It has often been assumed that one or the other of these two types of representations underlies cognitive processing in specific domains of cognition. For instance, in research on thinking, memory, and language processing, the traditional assumption is that properties, objects, situations, and events are captured by means of amodal representations. These representations typically abstract from the detailed aspects of the specific state of affairs that is being represented. For instance, the meaning representation of a word such as “dog” will include symbols for typical features of dogs. In contrast, in research on perception, it is often assumed that representations are modal in nature. When perceiving, for instance, a dog, it is assumed that humans create a rather specific representation preserving the perceptual properties of this dog. In this symposium, we will introduce a research unit located at the University of Tübingen, which proceeds from the notion that both formats play a major role in all cognitive domains. This unit aims at an overarching perspective that brings together the fragmented research approaches from different subdisciplines within psychology. We will unravel the functional roles of modal and amodal representational formats for cognition and investigate their interactions in different subfields of cognition (e.g., perception, learning, language, thinking, action). We will also investigate how these different representational formats develop and whether particular psychological disorders are associated with dysfunctions in one of these formats. The symposium begins with an introduction devoted to the distinction between modal and amodal representations and four talks presenting first results of some of the individual projects in the research unit.

The Relationship between Cheerfulness, Playfulness, Aesthetic Emotions, and the Beholder: It's Complicated

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Aesthetic emotions are emotional responses towards aesthetic experiences (e.g., visual art, music, but also jokes, parodies) including, among others, prototypical aesthetic emotions (e.g., awe, being moved), epistemic emotions, animation, amusement, negative emotions (anger, confusion), and nostalgia (Schindler et al., 2017). Personality factors and appraisals (e.g., Ruch, 2004; Ruch & Hehl, 2007; Scherer, 2005; Silvia, 2005) affect emotional responses to emotion inducing stimuli. The current study investigated the effect of selected personality dimensions (trait and state cheerfulness, playfulness) on aesthetic emotions in response to original visual arts and playfully modified versions of them. Online, 216 participants filled in the State-Trait-Cheerfulness-Inventory (Ruch et al., 1996, 1997) and the short measure for adult playfulness (Proyer, 2012) and viewed either the original or a modified version of in total four paintings. After each painting, they answered the Aesthetic Emotion Scale (Schindler et al., 2017). MANOVAS for each pair of paintings yielded a main effect of the painting's version on prototypical aesthetic emotions, epistemic emotions, animation and amusement for all four paintings. Cheerfulness and playfulness affected the participants' aesthetic emotions towards some, but not all paintings, indicating that the degree to which personality aspects affect art appreciation differ depending on the content and theme (and their appraisals) of the painting (see also Hosoya, 2019). It is possible that attitudes not included into this study (e.g., religiousness) may suppress or alter effects of cheerfulness and playfulness in certain paintings (e.g. paintings involving religious vs. non-religious topics). Implications of these findings on future investigations are discussed.

Facilitated speech perception with congruent audiovisual speech in a multi-talker scenario: An ERP study on aging effects

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In natural conversations, speech is usually perceived multimodally. The visual information supports processing especially when the auditory signal is ambiguous, for example in a multi-talker scenario. Additionally, age-related decline in sensory and cognitive abilities causes deficits in processing speech. In an ERP study, we investigated the behavioral and neurophysiological benefits of visual speech information in a dynamic cocktail-party scenario with 22 younger and 20 older adults. On a horizontal array, we presented three concurrent talkers with no additional, unspecific and congruent visual information. Target words had to be discriminated ("yes" or "no") while two distractor words (one-digit number words) were simultaneously presented. The target location was mostly central with rare lateral switches. Preparation and integration of the auditory input was enhanced with additional congruent speech, reflected in improved performance and modulated ERP amplitudes (P1, N1, P2, N2). In older adults, a decline in performance and electrophysiological modulations indicated inhibitory deficits and a deteriorated resource allocation. However, the general benefit of audiovisually congruent speech information was cancelled, when the target location changed unexpectedly. In conclusion, meaningful visual information presented from a fixated location improves speech perception in both younger and older adults.

„Hey automatisiertes Fahrzeug: park mich sicher und komfortabel ein ohne andere zu irritieren.“ Weglückenakzeptanz als Basis menschenzentrierter automatisierter Fahrstile.

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Für ein sicheres, komfortables und funktionierendes Miteinander von automatisierten und manuell gefahrenen Fahrzeugen im Mischverkehr ist Kommunikation eine essentielle Voraussetzung. Implizite Kommunikationsformen wie z.B. Geschwindigkeiten, Abstände und Verhaltensänderungen von Fahrzeugen spielen dabei eine zentrale Rolle. In einem menschenzentrierten Verkehrssystem sollen automatisierte Fahrzeuge sich konsistent mit bestehenden Kommunikationsregeln verhalten können. Von allen Interaktionspartnern als komfortabel und sicher akzeptierte Weglücken für geplante Fahrmanöver stellen eine Form impliziter Kommunikation dar, die auch automatisierte Fahrzeuge beherrschen müssen. Deshalb untersuchte die TU Chemnitz im Rahmen des Projekts @CITY-AF (gefördert vom BMWi) in Videosimulationsstudien die Weglückenakzeptanz in Parkszenarien, abhängig von unterschiedlichen Fahrzeugtypen, Geschwindigkeiten und Altersgruppen. Vorab aufgezeichnete Interaktionsszenarien im realen Straßenumfeld wurden 42 Probanden unterschiedlichen Alters als Videosequenzen in einer Simulationsumgebung gezeigt. Die Videos zeigten ein Links-Einparkscenario aus Fahrerperspektive, wobei unterschiedliche Fahrzeugtypen (Motorrad, PKW, LKW) in unterschiedlichen Geschwindigkeiten (10 – 35 km/h) die Parktrajektorie kreuzten. Die späteste noch akzeptierte Weglücke zum Starten des Einparkmanövers musste per Tastendruck angegeben werden. Die so ermittelten Weglücken sanken nichtlinear bei steigender Geschwindigkeit (riskanter), stiegen tendenziell mit der Fahrzeuggröße (konservativer) und ältere Probanden präferierten deutlich größere (konservativere) Lücken. Um daher menschlichen Erwartungen im Hinblick auf implizite Kommunikation zu entsprechen, sollen automatisierte Fahrzeuge insbesondere die nichtlinearen Weglückenfunktionen in Abhängigkeit der Geschwindigkeit des Interaktionspartners berücksichtigen. Die altersbezogenen Funktionsausprägungen können als Parameter wählbarer automatisierter Fahrstilprofile dienen, z.B. defensiv vs. dynamisch.

Exposure to untrustworthy sources: A challenge for source monitoring

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In modern-day digital environments, people are often exposed to information from sources whose trustworthiness is questionable. Having to deal with a large proportion of information from untrustworthy sources is challenging because it imposes a high burden on source memory. Advertising is viewed as an untrustworthy source because advertisers have an obvious self-interest to present products in a biased way. In two experiments, participants read a number of product statements. A high or low proportion of these statements were labeled as advertising. In a third experiment, one group of participants read only messages from trustworthy sources while another group of participants read messages from a trustworthy and from an untrustworthy source. Being exposed to a large proportion of information from an untrustworthy source induced increased source monitoring which decreased memory for the content of the messages. When participants failed to remember the source, they showed a bias towards guessing that a message originated from an untrustworthy source. Having to deal with untrustworthy sources thus may change how information is encoded and remembered in a potentially costly way.

Conditioned negative attitudes are “stickier” than conditioned positive attitudes: A negativity bias in evaluative counter-conditioning

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People often learn positive and negative information about an object in sequence. Sequential framing research has shown that reframing from positive to negative is, in most contexts, more effective than from negative to positive. We investigated if this sequential negativity bias applies to evaluative counter-conditioning. In evaluative counter-conditioning, conditioned stimuli (CSs) are paired with positive or negative stimuli in an evaluative conditioning phase; then in an evaluative counter-conditioning phase, the same CSs are paired with stimuli of the opposite valence. In three experiments (N = 100, N = 120, N = 362), we tested whether – consistent with a sequential negativity bias hypothesis – counter-conditioning is more effective when positively conditioned CSs are negatively counter-conditioned than when negatively conditioned CSs are positively counter-conditioned. We found this to be the case. There was no evidence that this negativity bias was driven by differences in memory. Furthermore, we found no evidence that a negativity bias nor a positivity bias occurs in a typical (initial) evaluative conditioning procedure. Results support previous findings in sequential framing literature by revealing a negativity bias in evaluative counter-conditioning. Our research suggests that attitudes are not stable over time, but they change with multiple pieces of information and the order that the information is received matters.

Binding of task-irrelevant contextual features in task switching

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Research employing prime-probe paradigms produced substantial evidence compatible with binding and retrieval mechanisms. We seek to extend the reach of the Binding and Retrieval in Action Control (BRAC) framework to task-switching paradigms. Our experiments test the hypothesis that a task-irrelevant context is subject to binding together with task-relevant features. This hypothesis predicts that repeating the same context features in trial *n* retrieves the trial *n* – 1 episode. Consequently, performance improves in task repetitions when the context repeats compared to when the context switches. Similarly, repeating the response when the context repeats along is easier than when the context switches. We designed a task-switching paradigm in which participants categorized digits as being odd or even, or greater or less than five. The context was operationalized as the colour of the cue (a vertical or horizontal rectangle). We manipulated cue-context onset asynchrony (CCOA) such that the cue immediately appeared blue or red in half of the blocks (CCOA 0 ms), whereas in the other half of the blocks, the cue appeared black for the first 300 ms and then changed to red or blue (CCOA 300 ms). Cue-target interval was held constant at 600 ms. Our data (N = 124) revealed a three-way interaction of task relation, response relation, and context relation, suggesting that irrelevant context features are bound with task-relevant features. Furthermore, the data revealed a three-way interaction of task relation, context relation, and CCOA, suggesting that binding took place primarily with the simultaneous onset of context features and cue.

Does Location Uncertainty Modulate Unconscious Processing Under Continuous Flash Suppression?

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Previous research suggests that selective spatial attention is a determining factor for unconscious processing under continuous flash suppression (CFS), and specifically, that inattention toward a stimulus location facilitates the unconscious processing of this stimulus by reducing the depth of CFS (Eo, Cha, Chong, & Kang, 2016). The aim of our study was to further examine this modulation-by-attention model of CFS using a number priming paradigm. Participants (N=26) performed a number comparison task on a visible target number ("compare target to five"). Prime-target pairs were either congruent (both smaller, or both larger than five) or incongruent. Spatial attention toward the primes was varied by manipulating uncertainty of the primes' location. Based on the modulation-by-attention model, we hypothesized: In trials in which the location of the primes was uncertain, reaction times (RTs) for congruent prime-target pairs should be faster than for incongruent ones. In trials with certain location of the prime, we did not expect a significant difference between RTs for congruent versus incongruent prime-target pairs. We analyzed our data with sequential Bayes factors (BFs). Our data show no effect of location uncertainty on unconscious priming under CFS. However, it turned out that even visible primes only weakly influenced RTs. Possible reasons for the absence of robust number priming effects in our study are discussed. Based on exploratory analyses, we conclude that the numerical order of prime and target resulted in a response conflict and interfered with the predicted priming effect.

The influence of the BDNF Val66Met polymorphism on mechanisms of semantic priming: Analyses with drift-diffusion models of masked and unmasked priming

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Automatic and strategic processes in semantic priming can be investigated with masked and unmasked priming tasks. Unmasked priming is thought to enable strategic processes due to the conscious processing of primes, while masked priming exclusively depends on automatic processes due to the invisibility of the prime. Besides task properties, inter-individual differences may alter priming effects. In a recent study, masked and unmasked priming based on mean response time (RT) and error rate (ER) differed as a function of the BDNF Val66Met polymorphism (Sanwald et al., 2020). The BDNF Val66Met polymorphism is related to the integrity of several cognitive executive functions and might thus influence magnitude of priming. In the present study, we re-analyzed this data with drift-diffusion models. Drift-diffusion models conjointly analyze single trial RT and ER data and serve as a framework to elucidate cognitive processes underlying priming. Masked and unmasked priming effects were observed for the drift rates v , presumably reflecting semantic pre-activation. Priming effects on non-decision time t_0 were especially pronounced in unmasked priming, suggesting additional conscious processes to be involved in the t_0 modulation. Priming effects on the decision thresholds a may reflect a speed-accuracy tradeoff. Considering the BDNF Val66Met polymorphism, we found lowered drift rates and decision thresholds for Met allele carriers, possibly reflecting a superficial processing style in Met allele carriers. The present study shows that differences in cognitive tasks between genetic groups can be elucidated using drift-diffusion modeling.

Mnemonic Capture Underlies the Intrusion of Unwanted Memories

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While memory retrieval is often voluntary, memories can also enter awareness against our will. Indeed, these intrusive memories are a hallmark of many psychological disorders (e.g. anxiety, OCD, PTSD). Even though unwanted memories are of major clinical significance and may also constitute a phenomenon of daily life, they have been proven challenging to study in the laboratory. Here, we isolated instances of involuntary retrieval in four Think/No-Think (TNT) studies and used fMRI to show that when involuntary retrieval occurs, activity arises in the right dorsal intraparietal lobule. When comparing the TNT with the Posner spatial cueing task, we found an overlap of the cluster associated with intrusive memories and areas engaged during reflexive reorienting of visual attention. We further demonstrate a similarity in the patterns of activation evoked by involuntary memory retrieval and by spatial reorienting. This evidence suggests a fundamental overlap between memory and attention; namely, a common mechanism that governs the involuntary capture of attention, whether attention is captured by an internal memory or by an external percept.

Garner effects with Modal and Amodal Stimuli

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It is often assumed that visual information is processed by qualitatively different, parallel streams in the human brain. In this vein, an influential study by Ganel and Goodale (Nature, 2003) demonstrated that Garner interference affects a visual discrimination task but not a visuomotor action task. A Garner paradigm includes a baseline condition in which only the task-relevant stimulus dimension is varied, and a filtering condition, in which task-relevant and task-irrelevant dimensions are varied. The observation of longer reaction times in the filtering condition compared to the baseline condition is named Garner interference (Garner, Cognitive Psychology, 1976). An online experiment with a Garner task was conducted with amodal stimuli (numbers) to investigate different representations (modal or amodal) in the visual streams for perception and action. Twenty-four participants judged with key presses the numerical size of a target number, while a distractor number was also presented in the visual field. Similar to Ganel and Goodale (2003), the reaction times in the baseline condition with a neutral distractor were shorter than those with a distractor that could interfere with the response to the target in the filtering condition. This effect was smaller for filtering trials with congruent distractor-target pairs, and larger for incongruent filtering trials. Further laboratory experiments with amodal stimuli and visuomotor tasks are planned, which may help in elucidating and distinguishing the nature and role of modal and amodal representations in the dorsal and ventral stream, respectively.

Smartphone behavior during the Coronavirus (COVID-19) pandemic

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Smartphone behavior gives us a chance to better understand how the corona pandemic has impacted people's lives. Studying app usage can provide a deep insight into digital as well as real world activities in the times of the pandemic. To this end we analyze data of over 1000 participants from Germany, who registered for our Murmuras study over a period of the whole year 2020.

In particular, we observe strong changes in early spring months, when COVID-19 spread rapidly in Germany, and the government introduced strict lock-down and social distancing measures. With limited in-person communication, social media and digital messengers can provide important means of coping with isolation. Our data supports such hypothesis. We see an increase in usage of apps in social and communication categories in March (> 20%) and April (> 15 %) compared to February 2020. Interestingly, we observe reverse effect for Media & Video category - usage dropped by 18% in March, while total phone usage increased by 15 min in the same period. Moreover, strong changes in usage of other apps like Google Maps provide insights into non-digital behavior and indicate how mobility was reduced.

Finally, we show how these trends continue and are impacted by the easing and later increasing restrictions over summer, autumn and winter months.

No evidence for a visual hindsight bias in data graph perception

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Visual hindsight bias is the retrospective underestimation of visual information required for identifying entities. While this phenomenon has already been investigated for the perception of faces or human beings in scenic photographs, we transferred the perceptual fluency paradigm by Harley et al. to the perception of data graphs. In a baseline phase, several data graphs were displayed in ten successively more informative stages, beginning with an incomplete plot (e.g., 10 data points) and ending with a complete plot (e.g., 100 data points). Participants were asked to stop the display as soon they were able to identify the inherent trend in each data graph. In the following memory phase, they had to select the information stage at which they previously identified the trend. Based on the assumption of perceptual fluency we hypothesized a visual hindsight bias, i.e., that from their memory participants would choose a more incomplete diagram than they had actually seen. Three sub-experiments were conducted online with varying stimuli: scatterplots of different trend shapes (linear, exponential, step function; N = 105), scatterplots with linear trends of three different slopes (N = 153), and rising vs. falling asymptotic line plots of different steepness (N = 138). None of the studies showed evidence of a hindsight bias. We argue that in the recognition of data graphs perceptual fluency is overridden by more complex analytical processes and insecurity, especially when familiarity with data graphs is low.

Right Place, Right Time: Spatiotemporal regularities guide attention in a dynamic setting

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Our environments are filled with regularities that can inform perception and behavior. These regularities can be particularly beneficial when facing multiple competing signals within our environment – as is the case in visual search. Although real-life search is often an extended process taking place in dynamic environments, it is traditionally studied through static displays. We have designed a dynamic-search task in order to consider the temporal dimension of visual search. With this task, we tested how participants utilize spatiotemporal regularities embedded within the environment to guide performance. Specifically, participants searched for eight targets amidst stimuli that faded in and out of the display over several seconds. In each trial one target appeared within each of the four spatially separated quadrants in a temporally predictable fashion rendering half of the targets both predictable in time and space. The other four targets were spatially and temporally unpredictable, meaning they could appear at any time in any quadrant. Across several experiments we demonstrated behavioral superiority for predictable compared to unpredictable targets. Moreover, we have demonstrated that this benefit is driven by both long- and short-term representations of the dynamic pattern. Eye-movements reveal additional insights into the dynamic orienting of attention during this task. Taken together, these our results demonstrate that observers use temporal predictions to guide spatial attention in a dynamic context akin to real-world search.

What is Left of them: Examining the Stability of Spatial Reference Frames with Disappearing Avatars

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In virtual environments and computer applications, we are often confronted with avatars that serve as spatial reference frames. These reference frames influence how the objects inside a scene are coded, e.g. by interpreting the object's position from the avatar's perspective. We examined the stability of these spatial reference frames in two experiments using an orthogonal Simon task with task-irrelevant avatars. The stimuli were presented at positions that could be coded as left or right, depending on the avatar's position. In the first experiment, the avatar either remained on screen during stimulus presentation or disappeared beforehand. We found evidence that the stimulus positions were coded from the avatar's point of view in both conditions. In the second experiment, the avatar stayed on screen for sets of five consecutive trials and vanished for the next set. Again, the results indicated that stimuli were regarded within the reference frame of the avatar, regardless of whether the avatar was visible during the trial or not. The evidence overall suggests that reference frames provided by avatars are relatively stable and remain active for several trials after their disappearance.

Ecologically rational strategy selection in decisions under risk

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The human mind is often assumed to be equipped with a repertoire of strategies that can be used to solve a particular problem. For example, in decisions under risk, humans have been shown to rely on different strategies, ranging from very simple heuristics to more complex expectation strategies. Rational metareasoning theory suggests that a decision maker selects a suitable strategy for a given problem by trading off each strategy's expected accuracy and expected costs in the respective problem. To understand how a decision maker could gauge these quantities, we simulated choice behavior of ten heuristic strategies on risky choice problems and analyzed which features of the choice problems represented predictive cues for accuracy estimation. For each strategy, we identified a small subset of features which allowed for a precise estimation of its accuracy. Our findings provide a proof of concept that strategy selection in risky choice can be informed by perceivable features of the choice problem and make it possible to specify computational models of risky choice in order to further investigate how exactly these features are integrated for strategy selection.

The impact of novelty and emotion on attention-related ERPs and pupil responses in children

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The unexpected occurrence of task-irrelevant sounds can involuntarily capture attention and can impair performance. A distinctive sequence of components in the event-related potentials (ERPs) in the EEG has been associated with different steps of attention capture. Moreover, event-related changes in pupil size enable conclusions on the activity of the locus coeruleus-norepinephrine system that modulates attention.

The present work aimed to examine attentional orienting/evaluation and reorienting mechanisms in response to emotional distractor sounds in 7 to 10-year-old children (n=32) and adults (n=32). We simultaneously registered ERPs and changes in pupil diameter in response to frequent repeated standard sounds and rare emotional and neutral novel sounds. Participants were asked to ignore the sound sequence and to watch a silent video.

Emotional compared to neutral distractor sounds evoked larger amplitudes of ERP-components associated with attentional orienting and larger pupil dilation responses in both groups. Attention-related ERP amplitudes to novelty were enhanced in children compared to adults. ERP results indicate an ongoing maturation of involuntary attention in the context of novelty processing in 7 to 10-year-old children. In contrast, processing of the emotional content of novel sounds did not differ between children and adults. Importantly, our results support the idea of a correspondence between the pupil dilation response and attention-related ERPs in the framework of attentional orienting in children. Results demonstrate that pupillometry is a suitable method to investigate the development of involuntary attention mechanisms that might be applied to sensitive groups.

Spatial Updating of Target Locations in Virtual Reality

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Spatial updating in virtual environments is usually impaired by a lack of cues to self-motion. We report an experiment studying two types of support for spatial updating to preserve spatial orientation in synthetic environments. We varied the availability of a wall close to a target as a landmark for reproducing the target's location and we varied the availability of additional visual stimulation during self-motion intended for strengthening the impression of optic flow. Participants wore a head-mounted display standing upright and performed a pointing task after passive forward translation in a virtual scene. Before translation, two target objects were presented, some of them close to a lateral wall. They disappeared and the location of one of the target objects had to be indicated by pointing after translation. In a subset of trials, a stripe pattern above the translation path was presented during translation to increase the impression of optic flow. Pointing error on the forward axis was reduced by the lateral wall as spatial reference for close target locations, the stripe pattern did not improve performance. In future experiments, real self-motion and further navigation techniques, different multimodal cues, different tasks, and different kinds of virtual environments will be studied.

The Effect of Prior Information on Information Sampling, Contingency Inference, and Choice

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Decisions between options should depend on the options' probabilities of a positive outcome. For a long time, research has presupposed that individuals infer probabilities or contingencies between options and outcomes by taking the joint co-occurrences of each option with each outcome into account. Yet, a wide range of studies showed that individuals may base their probability inferences or contingency inferences on more aggregate data in terms of skewed marginal frequencies instead of joint frequencies. As a consequence, subsequent choices were demonstrated to be sub-optimal. Besides, in related research, it has been shown that choices between options depend on whether information about the options' probabilities to result in a positive outcome have to be sampled.

In this project, we investigated the effect of (correct vs. false) prior information on information sampling behavior in sampling paradigms, in which participants were free to sample any option and in any order they desired during learning trials. Furthermore, we tested whether the prior information and the information sampled during learning influenced the use of marginal frequencies versus joint frequencies as well as their effects on subsequent consequential choices.

The results revealed that prior information guided information sampling and that self-determined information sampling facilitated the use of joint frequencies resulting in more accurate probability assessments. Nevertheless, participants were only partly able to adapt their prior beliefs if prior information was false. If prior information was correct, participants barely explored other options than the superior one.

Effects of a 6-Week Cognitive-Postural Multitasking Training in Older Adults

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Older adults exhibit decrements when performing cognitive-motor dual-tasks compared to single tasks (Beurskens et al., 2012). Additionally, compatibility of modality mappings in cognitive tasks has been shown to modulate dual-task costs in both domains (Stelzel et al., 2017). Previous intervention studies have demonstrated the effectiveness of cognitive-motor multitasking training in old age (Wollesen et al., 2014). Here, we tested whether the ability to coordinate task mappings under high postural demands improves in healthy seniors after a cognitive-postural multi-tasking training. Using a cross-over randomized controlled design, twenty-one older participants (11f, 10m; range = 63-83 yrs) were assigned to either a modality-compatible or modality-incompatible training group. Both intervention groups performed balance exercises on stable/unstable elements three times per week for six weeks. Throughout the intervention, working-memory load was gradually increased and the base-of-support was reduced. Group 1 performed the secondary cognitive task under compatible modality mappings and group 2 under incompatible modality mappings. Before training (T0), after the intervention (T1), and after a 6-week cross-over period (T2), participants performed spatial dual one-back tasks in bipedal stance on a balance pad. Irrespective of the intervention group, the results indicate improved working-memory performance and reduced dual-task costs after the passive control period, but no training-specific gains in cognitive performance. Furthermore, balance performance did not change significantly over time. Notably, participants demonstrated meaningful interindividual variability of training responses, which may be linked to neuropsychological performance at baseline. In conclusion, compatibility of modality mappings in multi-modal balance training appears not to affect the observed outcomes.

When Linguistic Uncertainty Spreads Across Pieces of Information: Confusing Facts in the News with Speculations

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Modern media enable a fast and almost unstrained reporting on any type of information, even on pieces of news that are (still) uncertain and eventually might turn out to be wrong. The present work investigated the idea that unrelated but jointly presented news of varying certainty (as indexed through the presence or absence of linguistic uncertainty cues such as “could” or “might”) mutually interfere with each other. Could a context that includes uncertainty cues (“speculative news”) impact on how unrelated “factual news” are remembered? Our participants read headlines with exclusively speculative news, exclusively factual news, or a mixture of both. Results showed that the uncertainty cues which were present in speculations were not lost in memory, but actually spilled over to the remembrance of unrelated reported facts. In turn, the latter appeared less certain than initially communicated. This bias to remember factual news as merely speculative persisted even when both types of news were presented sequentially (e.g., factual news first). This suggests that the presence of speculative news does not specifically affect encoding but bears the potential to overwrite memories on reported facts that had already been stored. Furthermore, a bias toward uncertainty emerged even in cases in which the proportion of presented speculations among factual news was low (6 out of 24 headlines) but increased linearly with the number of studied speculations. Given the wide-spread dissemination of preliminary and uncertain contents in the news, this bias poses a challenge in effectively getting confirmed information across to readers.

Eingriffsassistentz für Übernahmen in kritischen Ausweichsituationen beim automatisierten Fahren

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Fahrer*innen automatisierter Fahrzeuge ist es jederzeit erlaubt, in die Fahrzeugführung ein-zu-grei-fen. Die Forschung zur Interaktion von Fahrer*innen mit der Fahr-zeu-gautomation hat ge-zeigt, dass sie bei Übernahmen in kritischen Fahrsituationen deutliche Leistungseinbußen im Ver-gleich zum manuellen Fahren haben. Weiterhin wurden viele Erkenntnisse in Fahr-si-mu-la-tions-studien gewonnen. Die aktuelle Feldstudie prüft daher die Leistung der Fah-re-r*in-nen und ihre Be-wer-tung der Situation, wenn sie in die automatische Fahr-zeug-füh-rung eines re-a-len Fahr-zeugs in kri-ti-schen Über-nah-me-situationen eingreifen. Weiterhin evaluiert sie, ob die Fah-rer*innen beim Eingriff durch eine Ein-griffs-assis-tenz un-ter-stützt werden können. Dafür fuh-ren die Proband*innen acht Aus-weich-ma-növer mit einem Versuchsfahrzeug auf einem Flug-feld im Süden Branden-burgs. Die acht Manöver unterschieden sich hinsichtlich der zu fah-ren-den Teil-ma-növer (aus-scheren und ein-scheren), time headway zu einem si-mu-li-er-ten Hin-der-nis (gering und hoch) und der Kraftschlussausnutzung zwischen Rei-fen und Fahr-bahn (ge-ring und hoch). Er-fasst wur-den das Ver-hal-ten der Fahrer*innen und ihre Be-wer-tung der Über-nahmesituation. Die Er-geb-nis-se zei-gen, dass die Leistung der Fahre-r*in-nen bei Ein-grif-fen im realen Fahrzeug ver-gleichbar zur Leistung im Fahrsimulator ist. Die eingesetzte Ein-griffs-assistentz beein-flus-ste ihr Ver-hal-ten und Erleben signifikant. Die Er-geb-nis-se verdeutlichen, dass Übernahmen der Fahr-zeug-kon-trolle die Ver-kehrs-sicherheit negativ beeinflussen kön-nen. Die ge-testete technische Assis-tenz konnte die-se Effekte abschwächen, nicht aber gänzlich beseitigen.

Clinically-inspired investigation of bodily self-awareness

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Although in everyday life we usually do not reflect upon our bodily self-experiences, but pre-reflectively take them for granted, they may be heavily disrupted under various clinical conditions. Patients suffering from a supernumerary phantom limb, for instance, perceive more limbs than they anatomically possess (e.g. two instead of only one right arm), whereas patients with the Alice in Wonderland syndrome often perceive their body as disproportionately small (Microsomatognosia) or enlarged (Macrosomatognosia). Although such body misperceptions are well-documented after various neuropsychiatric conditions, their neurocognitive pathomechanisms still remain elusive. An experimental paradigm by which such aberrant body misperceptions can also be induced and investigated in healthy participants would therefore provide novel insights. In this talk, I would like to present two possible variations of the classical virtual hand illusion (VHI) paradigm which seek to induce such body misperceptions, in virtual reality environments. The first variation is the 'supernumerary limb illusion', in which two right-sided embodimentable virtual hands are presented to the participant, as if they both originated from the participant's right arm. The second variation is the 'resized limb illusion', in which the virtual hands presented strongly vary in size from the participant's real hand size. For both VHI variations, experimental data will be presented (in total: N = 59 participants), demonstrating that aberrant body-size misperceptions and experiences of limb duplication can also be induced, to some extent, in healthy participants.

Targeting challenges in the statistical analysis of experimental clinical data

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Clinical evaluation studies often face a multitude of challenges: for example, ethical considerations apply, participants are hard to find, data is not normally distributed, and comparable control groups are difficult to create. This often results in comparatively small samples and complex study designs. Researchers are then faced with the question how to best analyze their data. Even though more complex methods of analysis are becoming more common in psychology, many clinical studies still focus on classical tests like t-test and ANOVA. While they can be used in many situations, they do not always present the best option to find every existing effect. The present work explores and compares different statistical methods to address a consistent hypothesis in an experimental psychopathological data set of 70 participants. There were four assessments (within-person factor) of an experimental and a control group (between-person factor) with an intervention after the second assessment. Classical statistical tests (e.g., t-test, ANOVA) and more advanced statistics (e.g., SEM, multilevel models) will be compared. While there can be no simple answer to the question which method is the best, different suggestions will be given to when which method might be more appropriate in which situation, helping psychopathological researchers to make the most of their hard-earned data.

From unknown characters to audiovisual letter perception: Development of letter processing in the brain from pre-schoolers to practiced readers

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During reading acquisition, children learn to associate written characters (letters) with the corresponding speech sounds. Processing of audiovisual language information in the brain is thus fundamental to successful reading acquisition and relies on a distributed brain network that includes superior temporal and ventral occipito-temporal areas. So far, developmental neuroimaging studies mainly assessed reading-related specialization regarding auditory and visual word processing. However, still little is known on the neural adaptations underlying grapheme-phoneme learning at the very beginning of reading acquisition. In a longitudinal study and using combined electroencephalography - functional magnetic resonance imaging (fMRI) recordings we examined letter processing from illiterate pre-schoolers to practiced readers. First, we examined how the neural representation of unknown characters changes upon learning associations to the phonemes in prereaders. Second, we examined how visual and audiovisual processing of letters changes within the first years of reading acquisition. Our analyses focused on specialization in the visual processing of letters and the incongruity effect indicating differential processing of congruent and incongruent audiovisual letter presentations. Our results show that learning of letter-speech sound correspondences induces rapid changes in brain activations to visual letters reflected in the event-related N1 response and the corresponding ventral occipito-temporal (vOT) fMRI signal. Further, specialized responses to letters showed an inverted U-shaped developmental trajectory in convergence with the predictive coding framework of vOT function which suggests integration of bottom-up and top-down multimodal information.

Cross-codal information integration in narrative comprehension occurs immediately upon encounter.

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Visual narratives like comics are based on pictorial information but also contain textual elements requiring cross-codal integration during comprehension. Recent evidence indicates that cross-codal integration is associated with additional mental effort, implying codality dependent comprehension processes (Huff et al. 2020). The present study deepens our understanding of these processes by focusing on the time point of integration. We investigated if cross-codal information is integrated into the mental representation of the narrative immediately upon encounter (early integration) or later after the realization that it is needed for comprehension (late integration). Therefore, we performed an online study asking participants (N = 88) to view 24 comic clips panel by panel in a self-paced manner, while panel viewing time was recorded as an indicator of processing effort associated with integration. The clips were presented in uni-codal (all panels consisted of either texts or pictures) and cross-codal (critical bridging event panels were replaced by panels in a different codality; text in picture stories and picture in text stories) formats. A switch of codality within the story, compared to uni-codal narratives, led to increased viewing times. This increase in viewing times was significantly larger at the cross-codal bridging event panel itself than at the subsequent panel. These results are consistent with the hypothesis that cross-codal information is integrated into the event model immediately upon encounter (early integration).

Individual gaze behavior towards body and face features in complex scenes

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Vision creates an individually unique window to our world. Where we move our eyes determines what we perceive. For a long time, research has focused on low-level image properties such as color or orientation when exploring the mechanisms that drive our gaze. But recent research has shown that individuals show highly consistent differences in their gaze behavior towards certain semantic features of a scene. As it is unclear whether further such features of individual divergence exist we have expanded the annotations of an existing stimulus set with 700 complex everyday scenes with pixel masks for body and face parts. Preliminary results of eye-tracking experiments using these stimuli suggest consistent individual differences, especially in the tendency to fixate mouth and eye regions. In an additional online study, we are currently acquiring affective ratings for each depicted face in the stimulus set, which will allow us to study the role of perceived person characteristics for gaze behavior. Besides a detailed model of (individual) salience for persons in scenes, our work yields expanded and enhanced annotations for the Object and Semantic Images and Eye-tracking dataset (OSIE+), which we plan to publish for the benefit of all researchers investigating gaze behavior.

Testing the Limits of Cue Integration in Judgments of Learning With Pictorial Stimuli

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Although memory for naturalistic pictures is exceptionally good, relatively little is known about people's metacognitive ability to monitor their memorability. The current series of experiments investigated the accuracy and basis of metamemory in this domain. People studied pictures of naturalistic scenes and provided judgments of learning (JOLs), estimating the chances to recognize the photographs in a later test. Across three experiments, JOLs revealed substantial accuracy. Participants based their JOLs on multiple cues, most of which validly predicted recognition memory. Identified cues include intrinsic picture attributes in Experiment 1 (e.g., peacefulness of scenes; scenes with or without persons) and extrinsic aspects of the study situation in Experiment 2 (e.g., semantic distinctiveness of scenes with respect to the context; presentation frequency). In a third experiment manipulating 5 cues simultaneously, we found that the majority of participants integrated at least 3 cues in their JOLs. This hints at a considerable capacity for cue integration in JOLs, thus showing congruent results with recent studies on cue integration using verbal materials.

The extent and specificity of visual exploration determine the formation of recollected memories in complex scenes

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Our visual memories of complex scenes often appear as robust, detailed records of the past. It is assumed that the accuracy and the detail of our visual memories are dependent on the extent and quality of visual exploration. In this study, we related the extent and specificity of eye-related behavior at encoding and retrieval to the phenomenology of visual memories. In an incidental learning task, 44 participants (29 female, mean age = 25.02) encoded photographs of scenes into memory. In a surprise memory test, participants indicated whether an image was new, recollected or just familiar, and marked the image aspect that they specifically remembered, that appeared most familiar or that was particularly new to them, respectively. At encoding, we found that overall fixation patterns across the entire image area were more broadly distributed for subsequently recollected compared to familiar or forgotten scenes. Moreover, within memory-relevant image regions, fixations were more dense and more clustered for subsequently recollected compared to subsequently familiar scenes. At retrieval, scenes that were recollected were explored less than new or forgotten scenes, with a smaller number of fixations and less dispersed fixation patterns. Importantly, fixation density and clustering was greater in memory-relevant areas for recollected versus familiar or falsely recognized images. This pattern of findings suggests that more elaborate exploration during incidental encoding, with a subset of more focal and dense fixation clusters in specific image areas, increases the potential for recollection. At retrieval, recollected memories then guide fixations efficiently to specifically remembered scene content.

Delayed Rating of Autobiographical Memories

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Autobiographical memories (AMs) are voluntarily or involuntarily retrieved memories relating to a personal experience. AM's cued by odors have been shown to be particularly emotional. We conducted two separate experiments aimed at testing whether the enhanced emotion reported with odor-evoked AM's is due to the memories themselves being more emotional or whether this enhanced emotion reported is due to the presence of the odor during retrieval and memory rating. In Experiment 1, subjects were asked to retrieve an AM in response to pictures and odors. 48 hours later they were presented with their own memory and either the same cue or a semantically congruent cue from the other modality and asked to rate their memories on different attributes. Odor elicited AM's were older, but not more emotional than those elicited by pictures. Experiment 2 follows a similar method, except that words replace pictures and the subjective ratings are done 30 days after initial retrieval and in the absence of all cues. Firstly, we expect to find that odor elicited AM's are older, more emotional, more pleasant and lead to more feelings of being brought back to the event than word elicited AM's. Secondly, we expect odor elicited AM's to be rated more emotional when the source memory for the elicited cue is incorrect. This would be evidence that odors are actually associated with highly emotional events in memory, rather than that odor cues present during rating lead to emotional ratings of actually non-emotional memories.

On the time course of parallel processing in task switching with preview

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Research on individual differences in multitasking has shown that individuals either prefer a more serial or more parallel mode of task processing. Such preferences for cognitive processing styles can be identified in the task switching with preview (TSWP) paradigm. This variant of a task switching paradigm allows but does not oblige individuals to preview the stimulus of the next task switch in a predictable task switching procedure [AAABBB...]. Whereas individuals who prefer a serial processing mode continuously shield the tasks from each other, it is unknown when precisely individuals who prefer a parallel processing mode use the preview to prepare the next switch. In a first experiment, we tested n=45 participants with the TSWP paradigm and varied the onset and therewith the length of the preview within-subjects. This allowed us to disentangle whether parallel processing of the preview stimulus (1) occurs contingent upon the stimulus onset of the task to be performed or (2) is dependent on the length of the preview, irrespective of when the preview starts. Strikingly, parallel processing occurred independently of the duration of the preview indicating that a short preview may already be sufficient. In turn, this implies that the time when the preview stimulus is displayed in the task switching sequence is more important. To further test our interpretations, we are currently running a follow-up experiment, in which we provide the preview in discrete steps (and thus with the same length) throughout the sequence. Implications for individual differences in cognitive flexibility will be discussed.

TVA-based parameter changes in multiple sclerosis: relationship to visual impairment

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Multiple sclerosis (MS) is characterized by both visual and cognitive deficits. White and grey matter pathology caused by the disease can affect the visual system at any point from peripheral to central processing stages. In recent TVA-based studies assessing MS patients, a marked decrease of visual processing capacity was found. In particular, the parameter reflecting visual threshold was increased at later disease stages and related to cognitive ability. However, a possible influence of primary visual pathway pathology has not been tested in these studies. Therefore, the question arises whether an increase of the visual threshold really is an index of cognitive instead of visual dysfunction.

In the current study, we addressed this question in a sample of 45 MS patients (29 female), by relating visual processing capacity estimates to measures of visual impairment. To that end, a TVA-based whole report task, MARS letter contrast sensitivity, and VEP latencies were assessed in all patients at the same day. Moreover, verbal and performance IQ measures were also obtained to evaluate general cognitive ability.

The visual threshold parameter estimates significantly correlated with contrast sensitivity measures, and (to a lesser degree) with VEP latencies. Nevertheless, even when these associations were taken into account, there still was a significant and meaningful correlation between visual threshold estimates and cognitive ability measures.

Our results support the assumption that the TVA-based parameter estimate of the visual threshold is a valid index of cognitive dysfunction in MS, and does not simply reflect visual dysfunction.

Mental body rotation with egocentric and object-based transformations in different postures: sitting vs. standing

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A detail of previous studies on mental rotation, which has not received any attention so far, relates to the testing situation of the participants. In nearly every study, participants were tested in a sitting posture (and not standing). However, when considering embodied cognition approaches on mental processes, participants may not be able to fully exploit these processes when performing mental rotation tasks in a sitting posture. Therefore, the aim of the present study is to examine the potential influence of two different postures (sitting vs. standing), when solving mental body rotation tasks. Sixteen students (6 females) were tested in two mental body-rotation tasks (MBRT), requiring either an object-based spatial transformation (based on a same-different judgment) or an egocentric transformation (based on a left-right judgment) in a sitting and in a standing posture. Reaction times and response errors were analyzed in two three-way ANOVAs, with the factors orientation, task, and posture. Results revealed an effect of orientation and task, indicating that participants performed better for egocentric than for object-based transformations. However, there was no effect of posture. The different dynamics of postural control during sitting and standing do not induce different embodiment effects on mental rotation.

The relationship between confidence and accuracy in forced choice recognition

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In forced-choice recognition tests, confidence is often assumed to track accuracy so that experimental conditions associated with better performance levels are thought to be also associated with higher levels of confidence in correct responses. This positive relationship holds, however, only to the extent to which the same factors shape accuracy of and confidence in forced-choice recognition decisions. Here we show that while accuracy in forced-choice recognition tests relies on the balance of evidence supporting each of the alternatives – that is, it depends on the difference in evidence supporting the chosen and the rejected option – confidence relies only on the evidence supporting the chosen alternative, which leads to confidence-accuracy dissociations whenever evidence for foils is varied across experimental conditions. We contrast these observations from judgements of occurrence with tasks requiring judgements of frequency (regarding the number of presentations of each item within the study list) or judgements of recency (regarding the relative position of items within that list). We demonstrate that in those other tasks both accuracy and confidence seem to adhere to the balance-of-evidence principle, giving rise to the standard positive confidence-accuracy relationship.

Semantic Similarity of Alternatives fostered by Conversational Negation

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Conversational negation often behaves differently from negation as a logical operator: when rejecting a state of affairs, it does not present all members of the complement set as equally plausible alternatives, but it rather suggests some of them as more plausible than others. For example, when hearing an utterance such as "This is not a dog", we might expect the referent of the utterance to more likely be a wolf rather than for example a screwdriver. In fact, entities that are semantically similar to a negated entity - as indexed by distributional semantics similarity scores - tend to be judged as better alternatives (Kruszewski et al., 2016). In a series of cloze tasks, we show that negation likewise restricts the production of plausible alternatives to similar entities. Furthermore, completions to negative sentences appear to be even more restricted than completions to an affirmative conjuncting context, hinting at a peculiarity of negation.

The Practical Value of an Autobiographical Implicit Association Test for the Detection of Driving Under the Influence of Alcohol

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For over 25 years, implicit measures research has been contributing to theory-development. The practical value of such measures in real-world contexts, however, has rarely been examined. Nevertheless, contexts that seek to detect sensitive behavior, such as driving under the influence of alcohol (DUIA), are in urgent need of measures that are less sensitive to self-reporting related problems. In such contexts, people may not be honest when reporting on their behavior because of potential negative consequences. Early detection of people who are likely to drink and drive could result in more targeted prevention. Since past DUIA behavior is a strong predictor of future drink-driving, we tested the utility of an autobiographical Implicit Association Test (aIAT) that probes evaluation of statements about past DUIA behavior under conditions of automaticity (e.g., reduced

intentionality). In two studies (N=217; N=157), participants first completed the aIAT and then reported on past DUIA behavior and future likelihood of DUIA behavior. We then assessed other known risk factors of DUIA (i.e., beliefs, age, gender, and alcohol use). Both studies found that (a) aIAT scores were predictive of past and future likelihood of drink-driving, (b) the aIAT can classify DUIA offenders and non-offenders with relatively strong precision, and (c) aIAT scores offered additional predictive power beyond known risk factors of DUIA behavior. Although future research is necessary to further examine the utility of the aIAT in the context of DUIA, these initial results are promising and may open new roads to the detection, and ultimately the prevention of drink-driving.

Why visual working memory is not visual

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Neural activity patterns representing visual working memory content can be found in many regions of the human neocortex. Here, we argue that some of these regions represent visual content not in a purely visual but rather in a categorical format. We used fMRI and multivariate encoding models to assess whether mnemonic representation of remembered colors can be categorized as either detailed-continuous or categorical. To this end, subjects performed a conventional color working memory task using prolonged (10 s) delays and a retro-cue procedure in the MRI scanner. We sampled the memorized colors in a fine-grained fashion to closely capture the similarity-structure of neural activity patterns representing color. We then used cvMANOVA MVPA to estimate the variance explained by (1) sensory encoding models (continuous models, typically used for IEM) and (2) models informed by the boundaries and prototypes of typical color categories reported by the subjects (categorical models).

We found robust mnemonic color representations in V1, V4 and V01. Importantly, we found that during working memory, categorical models explained color representations in V4 and V01 significantly better than conventional continuous models. In contrast, we found no such differences in are V1 or when subjects were engaged in an immediate recall task with little demands on working memory. Our results support a view of working memory where storage relies on distributed circuits utilizing neural tuning functions with varying granularity and abstraction. Our results further suggest that some regions might change their tuning properties in the course of the working memory delay.

Cognitive demand promotes overweighting of extreme values in decisions from sequential samples

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Humans routinely make decisions based on sequential samples of numerical values, for instance, when deciding which of two online shops is cheaper. A common conclusion from computational modeling analyses in behavioral economics is that numerical values are subjectively compressed in their internal representation (i.e., extreme values are underweighted). However, several recent psychophysical studies of sequential number comparison have found evidence for the opposite pattern, namely anti-compression (i.e., an overweighting of the extreme values). Here we tested two candidate features of the experimental design that might explain the discrepancy in findings: the range of values in the stimulus set, and the sample-by-sample cognitive demands imposed by the task. We tested the influence of these features in an experimental study (conducted online) in which N = 400 participants were asked to judge the average value of number streams. Both the range of number values and the

difficulty of sample integration (participants had to simultaneously track one or two number streams) were manipulated in a between-subjects design. Using computational modeling, we found that the manipulation of integration difficulty, but not stimulus range, altered the form of nonlinear distortion: Higher integration difficulty was associated with anti-compression. These findings suggest that under certain circumstances, limited processing resources might be compensated by overweighting of extreme values to maximize one's accuracy in decisions under noise.

The salience of valence in visual search tasks

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Affective stimuli have been shown to be detected faster in visual search tasks compared to neutral stimuli. In the first experiment (N = 42), we tested whether stimulus valence acquired through evaluative conditioning also leads to shorter reaction times in a visual search task. Therefore, neutral stimuli were paired with either positive, neutral, or negative images before being used as the targets in a 4x4 visual search display. Participants were asked to indicate the column in which the target was present by clicking a corresponding button. Visual search times for positively and negatively conditioned targets were significantly shorter compared to neutral targets. In the second experiment (N = 40), we used different stimuli in order to enable feature and conjunction search. In addition, the visual search display contained either eight or 16 stimuli on random positions in a 5x5 matrix. Target stimuli were paired with negative or neutral images prior to being used in the visual search task. Participants were asked to indicate the presence or absence of the target by pressing one of two buttons. Search times tended to be shorter for negatively conditioned targets compared to neutral targets, in particular when the search display contained 16 stimuli. This is a first indication that learned affective associations might lead to prioritisation in a visual attention task. Currently, further studies are conducted in order to find more evidence for learned affective association leading to visual prioritisation.

Word signs recruit the visual word form area in proficient signers

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The inferotemporal cortex contains a specific region that preferentially respond to written words (the visual word form area or VWFA). It is unclear what drives the functional tuning of VWFA. It has been suggested that reading recruits this left inferotemporal region because it originally implements a perceptual repertoire of junction detectors applied on lines coming from foveal vision. In our study, we wanted to investigate the contrasting hypothesis that the functional preference of VWFA is partially independent of the low-level properties of the visual input. We tested whether VWFA would show functional tuning toward written and signed words in signers, two highly different visual symbolic codes that deliver similar linguistic content. We presented hearing participants, deaf participants who were fluent sign language users, and hearing participants who were fluent sign language users, with written and signed words using an fMRI adaptation design. In addition to observing adaptation to written words in the VWFA of all groups, we also found adaptation to signed words in both signing groups only. Interestingly, the absence of crossmodal adaptation between signs and words suggest that signs and words may rely on partially different brain representation in these two groups of signers. Our results indicate that the development of word selectivity in VWFA does not depend on specific low-level visual information but rather support that the primary role of this region might be to provide

a representation that is suitable for mapping visual word forms onto linguistic representation, even in people without aural experience.

The socially situated self: How the social environment shapes self-referential processing.

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Characterising objects as meaningful to the self is a powerful and ecologically relevant driver towards selecting, attending, monitoring and responding to stimuli in an environment. Indeed, self-relevant or associated objects reliably demonstrate benefits in information processing and/or response execution (i.e. self-prioritisation). Although some classical philosophies have treated the self as a stable solitary unit, more contemporary approaches recognise that the self is usually treated as special only in contrast to some 'other' – that is, the self is not an isolated entity, but one embedded within a rich social environment populated with other agents. Here we will integrate this philosophy of a socially situated self into the study of self-referential cognition. Relevant cognitive literature shows that a known other may benefit similarly to self in enhanced memory and this may vary as a function of culture. Further, an individual's group may be prioritised. So, both the individual and social selves may be prioritised. More persuasive evidence for the importance of the social environment, however, comes from direct modulations to the presence or magnitude of the self-prioritisation effect itself. Both the presence of others and socially defined spaces (e.g. territory) influence how the self-prioritisation effect manifests. The potential evolutionary basis of such modulations to self-prioritisation will also be discussed.

Multimodality of music listening: how live versus recorded versions of piano music influence self-report and physiological responses

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Although previous research has shown that performer movements can influence perception of expressiveness and emotion of a musical performance, it is still unclear how the visual aspect of a performer playing music live – compared to a recording – may influence a listeners' aesthetic experience. To test the hypothesis whether music is perceived differently as a live performance or as a recording, participants were invited to one of two concerts, where they heard three pieces of piano music (Bach, Messiaen, and Beethoven) performed live by a pianist or from a recording of that same pianist (counterbalanced across concerts). Experience was measured subjectively – through self-report questionnaires after each piece – and objectively – using physiological measures of skin conductance, heart and respiration rate, activation of facial (smiling and frowning) muscles, and mobile EEG. Preliminary results show that audience members felt greater connection to the musicians during the live performances music ($p = .006$). The desire to move to the music was stronger in the Bach compared to the Beethoven ($p = .013$), which may have been due to the Bach piece had a faster speed compared to the Beethoven. Inter-subject correlation (ISC) of physiology shows that audiences had less similar heart rate responses during recorded versions compared to live performances, but only in the Bach piece ($p < .001$). These results tentatively suggest that the multimodality of piano performances may influence the experience of music listening, though these effects may be modulated by specific features of the music (e.g., tempo).

Representations after mentally practiced one finger sequences are effector independent

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Mental practice (MP) refers to the repeated use of motor imagery and has been shown to improve motor performance. MP is often less effective than physical practice (PP). One crucial question is, whether the representations learned in MP and PP are different or not. It is assumed that effector-independent representations develop in both, MP and PP. In the present study, we investigated the development of effector-dependent and effector-independent representations in sequence learning in MP and PP using intermanual transfer tests. The task required 12 sequential key presses on the keyboard. 154 right-handed participants performed 4 practice sessions, each starting with a test. Additionally, they were tested 3 days and 4 weeks after the last practice session. The practice sequence, a mirror sequence, and two different sequences were tested with the practiced and unpracticed hand. In the first four sessions, the test was followed by MP, PP, or control practice. The MP and PP groups practiced one of the test sequences. The control practice group practiced a simpler sequence. An ANOVA of movement times (MTs) showed that in the practiced as well as in the unpracticed hand, MTs were significantly shorter in the practice sequence than in the other sequences indicating effector independent sequence specific learning after MP and PP, but not after CP. Interestingly, in PP MTs in the practice sequence were significantly lower in the practiced hand than in the unpracticed hand which indicates effector dependent motor representations. In MP, effector dependent motor representations were not observed.

A little doubt saves many mistakes: Early and late error detection in copy typing

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It is assumed that forward models internally predict the consequences of actions. This enables the detection of errors even before actual sensory feedback of an action is available. To investigate the mechanisms underlying error detection in copy typing, ten-finger typists and hunt-and-peck typists copy typed with and without visibility of the screen and with and without visibility of the keyboard. Results showed that the number of committed and reported errors did not depend on typing style, but that ten-finger typists typed faster than hunt-and-peck typists. In both groups, more errors were reported with visible screen than with covered screen. This underpins the importance of distal action effects for error detection. Importantly, ten-finger typists showed pre-error slowing in the five inter keystroke intervals (IKIs) before reported errors, but hunt-and-peck typists did not. This indicates that ten-finger typists noticed errors before their actual occurrence. Hunt-and-peck typists may not detect errors as early as ten-finger typists due to less precise internal models. In both groups, error slowing was observed in the last IKI before reported and unreported actual errors. Because at this point in time sensory feedback cannot yet be evaluated, it may indicate difficulties in action planning or unconscious error detection. Finally, in both groups post error slowing after unreported errors indicated error processing that did not pass the threshold of awareness. In conclusion, feedback from distal action effects and predictive mechanisms both contribute to error detection in typing. Predictive mechanisms do however depend on motor expertise.

Verbal Instructions and Action-Effect Learning

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The fundamental principle of action-effect learning is based on a theoretical concept that actions are associated with their perceivable consequences through bidirectional associations. A large body of research, investigating action-effect paradigm, is based on the idea that bidirectional associations are formed through actual behavior and perception of the consequences. The present research extends this idea further by investigating how verbally formulated action-effect instructions may contribute to action-effect learning. We present two online experiments with a speeded categorization task to test verbal action-effect learning. The effect of verbally formulated action-effect instructions was assessed by comparing response times and error rate in instruction-compatible and instruction-incompatible conditions. Forty-three (Exp. 1; student sample) and 401 (Exp. 2; non-student sample) adults participated in the studies. The results revealed a significant effect of compatibility, in both experiments, for error rates. Although the hypothesized interaction effect between critical and control trials does not reach conventionally assumed significance criteria, the result patterns are consistent with our hypotheses (i.e., descriptively smaller compatibility effect in the control condition). The present research contributes evidence to the idea that action-effect learning is not exclusively related to actual behavior but also achievable through verbally formulated instructions.

Measuring Directed Forgetting in Working Memory

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Recent studies suggest that information encoded into working memory (WM) can be completely removed. This assumption is supported by findings of facilitation of other WM processes upon forgetting cues. In the present study we gauge availability of the to-be-forgotten (TBF) information directly through a surprise test combining two paradigms designed to study forgetting in long-term memory (LTM) and WM. Participants (n= 346) remembered lists of words presented sequentially in separate frames. After off-set of each word, the frame turned either blue or orange, indicating a to-be-remembered (TBR) or TBF word, respectively. In two baseline conditions, participants remembered six (set-size 6) or three (set-size 3) words. In the set-size 6-3 condition, three out of six words were cued TBF. On an immediate local-recognition test for TBR words, participants performed equally well in the set-size 6-3 condition and the set-size 3 baseline, demonstrating complete removal. On a small subset of trials, we tested TBF words. To assess how often we could test TBF items without undermining the forget instruction, we varied the frequency with which the TBF words were tested (one, two, or four times) between participants. Very low recognition performance confirmed that TBF items were no longer available in WM in all TBF-frequency conditions. Yet, accuracy for TBF words was not completely at chance. We discuss how LTM may contribute to this finding. In sum, our study provides further evidence for the removal of information from WM and establishes a direct way to assess selective removal in WM.

Vection can be influenced by cognitive factors and personality traits

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Vection is a perceptual phenomenon that describes the visually induced subjective sensation of self-motion in the absence of physical motion. Previous research has discussed the potential involvement of top-down cognitive mechanisms on vection. Here, we quantified how cognitive manipulations such as contextual information (i.e., expectation) and plausibility (i.e., chair configuration) alter vection. We also explored how individual traits such as field dependence, depersonalization, anxiety, and social desirability might be related to vection. Fifty-one healthy adults were exposed to an optic flow stimulus that consisted of horizontally moving black-and-white bars presented on three adjacent monitors to generate circular vection. Participants were divided into three groups and given experimental instructions designed to induce either strong, weak, or no expectation with regard to the intensity of vection. In addition, the configuration of the chair (rotatable or fixed) was modified during the experiment. Vection onset time, duration, and intensity were recorded. Results showed that expectation altered vection intensity, but only when the chair was in the rotatable configuration. Positive correlations for vection measures with field dependency and depersonalization were found. Our results show that vection can be altered by cognitive factors and that individual traits can affect the perception of vection, suggesting that vection is not a purely perceptual phenomenon, but can also be affected by top-down mechanisms.

Learning from insight

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The idea that experiencing an insight could contribute to better memory is intuitively appealing and supported by prior research. However, the role of solution correctness as well as the role of solvers' confidence has remained unclear so far. The present study used magic tricks as a problem solving task to test the hypothesis that solution correctness, the strength of the Aha! experience, and feelings of confidence would each independently predict better recall of solutions after one week. As expected, solutions associated with Aha! experiences were remembered better than those without. Correctness and confidence independently predicted better solution memory. None of the two-way interactions between the predictors was significant. The lack of an interaction between ratings of Aha! and correctness suggests that regardless of correctness, the feelings underlying the Aha! experience are associated with stronger memory traces. This leads to the counterintuitive conclusion that at least part of the insight memory advantage is not due to actually having solved a problem correctly, but can also occur for incorrect solutions if accompanied by an Aha! experience.

Representation of human expert knowledge and cognitive processes during the teach-in of industrial robots

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The exchange of experiences about good practice is a basic requirement for understanding between human and technology, which helps to provide humans as strategic decision-makers and users with optimal support. In order to investigate the question of what characterizes good practice in the field of teach-in of industrial robots, we conducted a qualitative and descriptive study with the comparison of n=2 participants. An expert and a novice worked on the same task, programming a trajectory for milling a workpiece. The procedures of both subjects were extracted using eye tracking analyzes and video-supported retrospective think aloud interviews and the procedures were then described in a formalized manner. In addition, a qualitative comparison was made between the final results, in which the expert, as expected, did better than the novice. On the basis of the think aloud protocols, cognitive processes were identified that could be of particular interest in this context. Furthermore, eye movement characteristics are reported for a more detailed description of some of the reported cognitive processes. The present work shows a methodical approach to the formalized description of human expert knowledge during the teach-in of industrial robots. It forms the basis for different future projects, e.g. the development of guidelines for handy and efficient training of beginners or the establishment of user-specific assistance in the field of teach-in of industrial robots.

The omission response reflects specific and unspecific predictions in action-effect couplings

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When people expect a sound to happen but it is unexpectedly omitted, a response to omission can be recorded using EEG. Recent models of perception state that this response is the result of error signaling caused by a prediction of a sound that is not met by any input. SanMiguel and colleagues (2013) used button presses coupled with sounds to induce auditory predictions in two conditions: in one condition button presses were coupled with a single sound, where in the other condition the sound changed after every button press. When sounds were unexpectedly omitted, ERPs showed oN1, oN2 and oP3 prediction error-related responses to omission only in the single sound condition, while no such responses were observed in the changing sound condition. SanMiguel and colleagues (2013) therefore concluded that a prediction can only be formed when the identity of the upcoming stimulus is known.

Given the importance of omission responses for understanding the role of prediction in perception, we replicated the study of SanMiguel and colleagues (2013). We used double the number of participants to enhance power, and PCA to extract components. Our results replicate the effects observed in the single sound condition, but we additionally observed smaller oN1 and oP3 responses in the changing sound condition. This suggests that an unspecific prediction - some sound is expected at a certain time - is formed even if no identity information is available about the upcoming stimulus. Significant amplitude differences between conditions imply that sound identity nevertheless plays an important role.

Altered Interoceptive Perception and the Effects of Interoceptive Analgesia in Musculoskeletal, Primary, and Neuropathic Chronic Pain Conditions

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Chronic pain (CP) severely disrupts the daily life of millions. Interoception (i.e., sensing the physiological condition of the body) plays a pivotal role in the aetiology and maintenance of CP. As pain is inherently an interoceptive signal, interoceptive frameworks provide important, but underutilized, approaches to this condition. Here we first investigated three facets of interoceptive perception in CP, compared with pain-free controls. We then introduce a novel interoceptive treatment and demonstrate its capacity to reduce pain severity in CP, potentially providing complementary analgesic treatments. Study 1 measured interoceptive accuracy, confidence and sensibility in patients (N = 60) with primary, secondary musculoskeletal, and neuropathic CP. Compared with matched controls, CP participants exhibited significantly lower interoceptive accuracy and interoceptive confidence. Pain severity was predicted positively by interoceptive accuracy, anxiety and depression, and negatively by interoceptive confidence. Study 2 tested a promising new interoceptive treatment for CP, in a single-blind between-subjects design (N = 51) with primary, secondary musculoskeletal, and neuropathic CP patients. The treatment specifically activates the C-Tactile system, by means of controlled stimulation of interoceptive unmyelinated afferents, at 3 cm/s with a force of 2.5 mN. This treatment led to significant pain reduction (mean 23%) in the CP treatment group after only 11 min, while CP controls who received comparable but non-interoceptive stimulation reported no change in pain intensity. These studies highlight the importance of interoceptive approaches to CP and demonstrate the potential of this novel method of C-Tactile stimulation to provide complementary analgesic treatments.

Overclaiming questionnaires detect applicant faking as well as an established measure of faking

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In the context of personnel selection, self-reports are often biased by social desirability. For example, applicants may overstate their knowledge to make a good impression on a potential employer. Overclaiming questionnaires (OCQs) offer a means to assess whether applicants claim to have knowledge that they do not actually have. Previous studies evaluating whether OCQs are capable of detecting faking in personnel selection contexts reported mixed results, but did not take the fit between the content of OCQ items and the selection context into account. The present study therefore used an OCQ that was adapted to the application context. To investigate the usefulness of such a tailor-made OCQ for detecting faking, we compared the detection performance of the OCQ with the detection performance of Residualized Individual Change Scores (RICS), an established measure to detect faking that was based on an achievement motivation questionnaire in the current study. A total of 123 participants first answered the OCQ and the motivational questionnaire in a control condition without application context. The two measures were then completed again as part of a mock application, and participants were asked to honestly report their faking behavior. Participants showed more overclaiming in the application context than in the control condition. OCQ and RICS predicted participants' self-reported faking equally well. These results suggest that OCQs can compete with an established measure of faking if their content is suitably adapted to the application context.

Classifier Analysis of EEG Data from an experimental clinical psychology study

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Past research has investigated the dissociative state of mind but did not find consistent neurobiological correlates. One challenge in this field of research is to control for the cause of the dissociation, as different provocative events likely yield to slightly different neurological effects. The present study addresses this issue with a new approach to trigger dissociative symptoms through audio and visual impulses. The control group was exposed to low frequencies of the same impulses. The present study investigates whether both groups can be distinguished by their EEG data using a classifier. It is hypothesized that especially differences between the temporal cortex, the theta waves, and the connectivity can be utilized by a classifier to separate both groups. EEG data was assessed for a total of 60 participants. The original signal, frequency bands, and change values were used for the present analysis. The EEG data was preprocessed, e.g., blinks were removed, and the common spatial pattern (CSP) algorithm was applied to prepare the data for linear classifiers. A first step explored whether both groups can be separated with a classifier. A second step tried to improve on the first results using a combination of classifiers. The results are discussed as a sample usage case of machine-learning for the field of clinical psychology.

Knowledge transfer between younger and older employees from a social comparison perspective

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While knowledge transfer between older and younger employees has been emphasized as a relevant and urgent need for managing sustained business success in organizations, it does not occur automatically. Instead, a motivational dilemma about whether to engage in knowledge transfer may occur in older and younger employees, stemming from social categorization processes. Current research focusses on social categorizations based on demographic (dis)similarities and falls short at considering that employees of different age groups may also consider status (i.e., one's present or future position in the organizational hierarchy) as a relevant point of comparison. We expect that the outcome of social comparison determines age-specific pathways, which in turn links to subsequent knowledge transfer. The aim of our first study is to establish the central assumption that temporal social comparison processes (i.e., perceptions of present or future status threat derived from the comparison with an older or younger person) are related to a knowledge sharing enhancing pathway and a knowledge sharing inhibiting pathway. To test this assumption, we conducted an experimental study in which we manipulated social comparison as a between-subject factor by giving participants a bogus performance feedback on a verbal ability test (i.e., solving anagrams) relative to their matching partner "P43". We will present and discuss our results at the conference.

Two Values Work Alike: Linking Proenvironmental and Privacy Preserving Behavior

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The present contribution discusses the transferability of models explaining and predicting norm and value-based behavior from the field of proenvironmental to privacy preserving behavior, where little research exists. Structural similarities and differences are debated and supplemented with current research. Proenvironmental and privacy preserving behaviors vary inter-individually and intra-individually in different areas of life (e.g., consumption, transportation, usage of digital services). Characteristic for both is that behavior often involves a high cognitive and behavioral effort in preparation, execution and maintenance. In everyday life, proenvironmental and privacy preserving attitudes are not always transferred into actions, for instance, because the immediate individual interests are opposed to the long-term collective ones (e.g., the “privacy paradox”). Furthermore, behaviors in both areas require the presence of a problem awareness. Differences manifest in the influence of internal and contextual factors. In contrast to proenvironmental, privacy protective behavior particularly depends on context and situation. Privacy preserving behavior is increasingly associated with digitalization, which raises the barrier of knowledge acquisition. Proenvironmental behaviors often spill over and long-term consequences of one's own behavior can be oriented to promoting gains or reducing losses. Privacy preserving behavior is primarily aimed to prevent negative consequences. Additionally, the forming of problem awareness is probably less driven by self-transcendent, collective-ecocentric, but rather by a self-enhancing (individual) and anthropocentric orientation. We would like to discuss the proposed similarities and differences with the conference participants and provide insights into first empirical studies, supporting the assumption of transferability of models from proenvironmental to privacy preserving behavior.

Using task-optimized neural networks to understand how experience may shape human face perception

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We perceive and recognize faces quickly and seemingly effortlessly. How does this remarkable ability develop and what is the role of experience? Here we addressed these long-standing questions by leveraging recent successes in deep convolutional neural networks (CNNs) as models for human visual recognition. Specifically, we asked whether CNNs trained on generic object recognition are able to capture human face behavior, or whether face-specific training is required. To measure human face perception behavior, subjects (n=14) performed a similarity arrangement task on 80 different face images (five images of each of 16 different identities). Using representational similarity analysis, we compared the behavioral similarities with representational similarities obtained from different layers of a CNN trained on either object (Object CNN) or face identity (Face CNN) categorization. Critically, the face identities used as stimuli were not included in the training and thus “unfamiliar” to the Face CNN. We found that the Object CNN correlated significantly worse (Spearman's $r=.21$) with human face behavior than the Face CNN (Spearman's $r=.42$), which reached noise ceiling. Moreover, late layers in the Face CNN mimicked human face behavior better than early layers. Our results promote the use of face-trained CNNs as model for human face behavior. Moreover, these results suggest that, in contrast to other aspects of visual perception, human face perception abilities do not naturally

emerge from generic visual experience. Instead, face-specific experience during development may shape and fine-tune human face perception.

A p-curve analysis of the experimental evidence on the influences of culture and age on episodic memory

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Cross-cultural studies on episodic memory in young adults suggest that Westerners tend to form context-free memory representations of focal stimuli, whereas East Asians holistically integrate focal stimuli and contextual information. Such differences are expected to be magnified with aging, given the long-term experiences in using memory strategies within a culture (e.g., Park & Gutchess, 2006). However, the empirical evidence is rather mixed with some studies supported the idea that cultural differences increase with age, while other studies reported the reverse pattern. To evaluate the empirical literature on the influence of age and culture on episodic memory performance, we conducted a systematic literature search and subjected the identified experimental studies to a p-curve analysis in order to analyze the extent of the evidential value and to control for publication bias. The results from the p-curve analysis supported the empirical evidence for an interaction between culture and age regarding episodic memory. At the same time, there was no evidence for p-hacking strategies or selective reporting. Future research needs to clarify under which boundary conditions cultural differences in episodic memory performance are increased or decreased with age and how important the relative contribution of changes in basic cognitive mechanisms and acquired knowledge on changes in episodic memory throughout the lifespan is.

Cognitive demands of a go/no-go reaction time task affect balance control

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Recent studies have shown that task interference is present when assessing a balance task in parallel with a cognitive task under a dual task paradigm. Yet not much research has been focused on the temporal structure of how the cognitive task affects the motor task. In this study we paired a go/no-go two choice reaction time stop-task with a balance-task. We tested 21 healthy subjects (15 female, age: 25.8 ± 6 years), who were asked to stand relaxed but not still over 288 trials during the experiment. Subjects had to react by blinking with either the left or right eye in correspondence to a visual stimulus presented on a computer screen. In 25 % of the trials an additional delayed audio tone signaled that the reaction had to be suppressed. The delay was adjusted to result in a suppression-rate of 50 %. Blinking responses were measured with EMG recordings of the m. orbicularis oculi, balance control was determined by COP data of a force-plate. During analysis the data was divided into subsets to represent relevant phases of varying cognitive demands and then subtracted in pairs to isolate effects of interest. We used a point-based resampling technique to compare the difference-curves to a corresponding zero-condition with respect to their temporal structure. We were able to find effects of the cognitive task on balance control. Independent of the response direction subjects show a shift in mediolateral direction in trials with unsuppressed reactions contrasted with trials with regular reactions.

On the functional origin of cumulative semantic interference in picture naming: An EEG-Study

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When naming a sequence of pictures of the same semantic category (e.g., clothes), latencies increase with each additional category member. While this cumulative interference effect is said to come into effect at the lexical level of language production, reflecting lexical competition (e.g., Howard et al., 2006) or incremental learning (Oppenheim et al., 2010), the origin of the effect is still a matter of debate. Some assume that it originates between the conceptual and lexical level (e.g., Howard et al., 2006; Oppenheim et al., 2010). Belke (2013), however, demonstrated that cumulative effects are also observed in a receptive semantic classification task but in this case facilitation is observed instead of interference, suggesting a common conceptual-semantic origin of both effects.

In two EEG-experiments, we investigated the neuro-cognitive signatures of cumulative semantic interference and cumulative semantic facilitation in the same group of participants (N=36) to better understand the underlying source of the two effects. As expected, within a given semantic category, speakers' response latencies systematically increased in the continuous picture naming task and decreased in the semantic classification task. This is also supported by preliminary analyses of the speakers' ERPs. Furthermore, the behavioral data show that cumulative interference in picture naming can be predicted by the individuals' effect sizes of cumulative facilitation. The greater the facilitation effect, the smaller the observed interference. Our results, thus, replicate and extend the findings by Belke (2013), and point to a conceptual-semantic origin of cumulative semantic interference in picture naming (see also Abdel Rahman & Melinger, 2019).

Working memory use as it emerges during natural behaviour

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Working memory (WM) is considered a fundamental cognitive function, supporting tasks that require bridging between perception and subsequent behaviour. Its properties, such as its capacity, have been thoroughly investigated in highly controlled laboratory tasks. Much less is known about the utilisation of WM in natural behaviour, that is when reliance on working-memory emerges as a natural consequence of interactions with the environment. By tracking head, hand, and eye movements during an adapted object-copying task, we derived an implicit measure of the tradeoff between reliance on working memory and gathering information externally during immersive behaviour. By manipulating the locomotive demands required for task completion, we could investigate whether and how WM utilisation changed as gathering information from the environment became more effortful. Reliance on WM was much lower than predicted based on WM capacity measures in typical laboratory tasks. As sampling information from the environment required increasing locomotion, participants relied more on their WM representations. This reliance on WM increased in a shallow, but linear fashion and was associated with longer encoding durations. Participants' avoidance of working-memory usage showcases a fundamental dependence on external information during ecological behaviour, even if the potentially storable information is well within the capacity of the cognitive system. These findings highlight the importance of investigating how the use of cognitive processes unfolds within natural tasks and extend our understanding of the interplay between memory and perception in immersive behaviour.

The influence of depression-related emotion on event-based prospective memory

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Event-based prospective memory (PM) involves remembering to carry out a previously planned action when a specific event occurs in the future. Previous studies found impaired PM performance in participants with depression (e.g., Altgassen, Kliegel, & Martin, 2009). As there are different depression-related emotions (e.g., shame and guilt), it is crucial to examine which emotion may contribute to impairments found in participants with depression. In two experiments, we investigated effects of shame on event-based PM in healthy young adults. In both experiments, we manipulated mood (shame group vs. neutral control group) during a computerized event-based PM task. Shame was induced by asking participants to write about an autobiographical shameful event (shame group), whereas the neutral control group wrote about their daily routine. As the PM task, participants were instructed to press a special key when one of several target words appeared during an ongoing color-matching task. We used the multinomial processing-tree model of event-based PM (Smith & Bayen, 2004) to obtain estimates of the prospective component of PM (i.e., remembering that something had to be done) independent of its retrospective component. In both experiments, the prospective component was impaired in the shame group compared to the control group. These results suggest that shame may play a role in PM problems associated with depression.

Unveiling low-level to high-level functions of visual cortex using task-specific deep neural networks

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The human visual cortex enables visual perception through a cascade of hierarchical computations in cortical regions with distinct functionalities. Here, we introduce an AI-driven approach to discover the functional mapping of the visual cortex. We related human brain responses to scene images measured with functional MRI (fMRI) systematically to a diverse set of deep neural networks (DNNs) optimized to perform different scene perception tasks. We found a structured mapping between DNN tasks and brain regions in early visual regions and along the ventral and dorsal visual streams. Low-level visual tasks mapped onto early brain regions, 3-dimensional scene perception tasks mapped onto the dorsal stream, and semantic tasks mapped onto the ventral stream. This mapping was of high fidelity, with more than 60% of the explainable variance in nine key regions being explained. Together, our results provide a novel functional mapping of the human visual cortex and demonstrate the power of the computational approach.

Close but not distant negative flanker affect crowding across depth

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Crowding refers to the phenomenon of reduced target recognition for peripherally presented visual stimuli when they are flanked by similar stimuli compared to when they are presented in isolation. Crowding is influenced by the spatial configuration of stimuli, including stimuli's depth. Further, there is evidence that stimulus emotion influences crowding effects in two-dimensional space. Here, we investigated whether stimulus emotion affects crowding also across depth. Real depth presentation of to-be-identified targets and two surrounding flanker stimuli was achieved by superimposing the displays of two screens via a half-transparent mirror. To ensure that effects of stimulus emotion on crowding are not confounded by potential perceptual differences between emotional and neutral stimuli, Landolt Rings with opposing gap positions were evaluatively conditioned with negative and neutral IAPS pictures. In Experiment 1, targets were presented at fixation depth and the position of the flanker stimuli was varied across depth. Further, negatively or neutrally conditioned Landolt Rings were either used as flanker (Exp. 1a) or target stimuli (Exp. 1b). Results indicated that only flanker emotion in front of or at fixation depth affect crowding. In Experiment 2, target stimulus emotion was manipulated. The flanker stimuli were presented on fixation depth while the position of the evaluatively conditioned target was varied across depth. Thus, either a negative or neutral target stimulus was presented in front or behind the not-conditioned flanking stimuli. Results indicated only a marginal effect of target emotion.

Psychosis proneness is associated with decreased reliance on low-level prior expectations in auditory decision-making

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Perception is an inferential process in which the brain integrates current sensory input and prior information about the environment and its statistics. An imbalance of these factors across the cortical hierarchy is thought to underlie several mental disorders, including schizophrenia.

Here, we investigated the differential weighting of high- vs. low-level prior information across the psychosis-proneness spectrum (PPS) in the general population. N=150 participants completed an online gamified auditory task, in which a specific number of click sounds was presented to each ear monaurally. Participants reported on which ear they perceived more clicks. Each trial started with a cue which predicted the dominant ear with 75% accuracy. In repeat blocks, the dominant ear of the previous trial was repeated with 80% probability; in neutral blocks, it was determined randomly in each trial. This led to the emergence of adaptive serial biases towards previous trial responses, reflecting low-level perceptual priors for the current trial's percept.

We modeled responses as a function of target stimulus, cue and serial response biases elicited by up to three trials in the past ($t-1$, $t-2$, $t-3$). We found small but reliable serial response biases in both block types (Repeat blocks: $\beta(t-1)=0.0413$, $t(5)=7.021$, $p<0.0001^*$; $\beta(t-2)=0.0127$, $t(5)=2.195$, $p=0.028^*$; $\beta(t-3)=0.0099$, $t(5)=1.752$, $p=0.08$ (ns); neutral blocks: $\beta(t-1)=0.0241$, $t(5)=4.474$, $p<0.0001^*$, $\beta(t-2)=0.0218$, $t(5)=4.016$, $p<0.0001^*$, $\beta(t-3)=0.0028$, $t(5)=0.520$, $p=0.603$ (ns)). Furthermore, serial biases were reduced in more psychosis prone individuals ($\beta(\text{PPS}*t-1)=-0.0090$, $t(9)=-6.797$, $p<0.0001^*$, $\beta(\text{PPS}*t-2)=-0.0027$, $t(9)=-2.088$, $p=0.037^*$, $\beta(\text{PPS}*t-3)=-0.0018$, $t(9)=-1.415$, $p=0.157$ (ns), both block types).

Our results suggest decreased serial response biases in psychosis-prone individuals, which may reflect an abnormal weighting of low-level prior information in this population.

Embodiment of approach-avoidance behavior: Motivational priming of whole-body movements in a virtual world

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Previous studies showed that humans can flexibly reconfigure manual reactions to motivational stimuli in order to produce compatible changes in visual environments (i.e., approach appetitive and avoid aversive stimuli). Using a virtual reality headset, we examined whether analogous flexibility is observed with whole-body movements in forward and backward directions that produced (non-)corresponding visual movements in a virtual environment. Two experiments showed that initiation of a forward movement was facilitated in response to a (pleasant) flower and a backward movement in response to an (unpleasant) spider, even when the movements resulted in reverse visual motions towards the spider and away from the flower. In contrast, visual motions were more important when attention was shifted to the visual motions in the virtual world (Experiment 3) or when these motions were controlled manually (Experiment 4). Overall, results suggest that there is a highly overlearned connection between locomotion and approach/avoidance that is difficult to override. A perceptual control theory of embodied motivated action is proposed.

The Cognitive Eye: Towards a Standard for the Assessment of Cognitive Load Through Oculomotor Functions

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Cognitive overload impairs the ability to properly respond to critical events. Recent studies indicate that already brief periods of high cognitive load exert a considerable influence on secondary task reaction times. For this reason, a wide range of measures has been applied to determine the exact level of mental workload. The current study aims to support the development of standardized techniques by contrasting selected physiological and behavioural measures. Oculomotor functions from the somatic (smooth pursuit eye-movements) and autonomic nervous system (pupil size changes) were tested in a sample of 27 participants during an auditory n-back task and compared with established parameters to evaluate cognitive load (reaction times, accuracy rates). Results indicate that secondary task smooth pursuit eye-movements are capable to roughly distinguish between low and moderate levels of cognitive load, whereas pupil diameter enables to finely differentiate low levels from moderate and hard conditions. However, a precise distinction of particularly high states of mental workload was possible only by considering behavioural measures. While reaction times reveal a similar sensitivity as pupil size changes, accuracy rates (omissions and false-positive selections) reliably differentiate between all states of cognitive load.

Event Cognition – Subtle Changes in Visually Cued Action Influence Memory

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While we experience the world as a continuous stream, several theories propose that our memories are divided into discrete events (e.g. episodic memory; Tulving, 2002). One model, the Event Horizon Model (EHM; Radvansky, 2012), explains the discreteness of events in memory based on online segmentation of events or event shifts. One prediction of the EHM is that recently encountered information is harder to access in memory following an event shift. Previous experiments have found a Location Updating Effect, whereby spatial shifts (vs no shifts) led to more forgetting of recently learned information. The current experiments aimed to further test the EHM using visually cued action changes as non-spatial event shifts (on half of the trials) and three different sizes of incidentally learned word lists (shifts occurred halfway through the list). In Experiment 1 subjects learned lists of words, each list being followed by a memory probe for first word in the list. Supporting the EHM, we found more forgetting in shift-trials than non-shift-trials. Experiment 2 probed the first word after a shift (resp. the corresponding position on non-shift trials). The results indicate that shifts improve memory for information after the shift, but only for large sets. Future research is needed to determine whether this is due to a) enhanced memory for information surrounding a shift, b) enhanced memory for smaller events, or c) another alternative. Overall, we provide further evidence for the EHM and successfully introduce two highly controlled and easy to manipulate paradigms for further research of the EHM.

No-report paradigms to study (visual) awareness

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In multistability, several possible interpretations of a stimulus alternate in awareness. To study this phenomenon, participants are typically required to continuously report their perception. The act of reporting in itself can, however, interfere with additional tasks, with the simultaneous report of another stimulus or with perception as such. Moreover, reports can be prone to a variety of biases, and in some cases veridical report conflicts with behavioural goals - for example, when certain perceptual interpretations are associated with reward.

To circumvent these issues, we developed 'no-report' paradigms for several types of multistability. These use eye movements as markers of the perceptual state. In binocular rivalry, we present two distinct stimuli that drift in different directions to the two eyes. The perceptually dominant stimulus then determines the direction of the optokinetic nystagmus (OKN); in turn, perception can be continuously inferred from OKN direction.

In my talk I will present some recent results we obtained by using this approach. First, stimuli associated with more uncertainty about a subsequent outcome (e.g., reward) dominate over stimuli that signal outcome with certainty. Second, stimuli that are associated with more perceptual uncertainty dominate over stimuli that are easier to discern. Third, after arbitrary associations between sounds and visual stimuli have been established, playing a sound increases the dominance of the corresponding visual stimulus. These results exemplify how different kinds of associations – with outcome, with uncertainty or with other modalities - impact visual awareness and how no-report paradigms allow measuring these effects unobtrusively.

A Psychologically-driven Ontological Model of Situation-specific Behavior based on State and Trait Markers

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Computational ontologies are formal models of knowledge. In Psychology, ontologies are used to describe concepts and their relations. Computer Science has used ontologies for a similar purpose in an attempt to provide machine-processable models allowing the extraction of novel insights through automated reasoning. Recently, ontologies have also been used to represent and model mental processing and human emotions.

Building upon these endeavors, we developed a psychologically-driven ontological model for the representation of human behavior (B) and its interactions with a person's (P) (affective, cognitive or motivational) state and personality (trait markers) in relation to the context (S; situation) in which the behavior occurs. The ontology extends existing ontologies. It provides a 3-tiered ontological model that represents the core generic concepts of the BPS-triad, domain-specific knowledge for a specific behavior area (e.g., mental well-being), and application-specific knowledge for a particular use case (e.g., anxiety and emotion prediction).

The model is validated through semantic and competency analysis, applying the ontology to specific domains and comparing the ontology predictions to datasets to real-life experiments.

The ontology provides a holistic framework and terminology for the testing of psychological theories and building applications leveraging the reasoning capabilities of the knowledge base. For example, we apply our ontology for anxiety and depression detection during the current COVID-19 pandemic.

The Impact of Adaptive Working Memory Training on Executive Functions and Reading Ability in Middle Childhood

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The effects of working memory (WM) training on cognitive and academic development in childhood recently became a topic of much scientific interest and controversy. WM is a reliable predictor for higher-order cognitive skills and academic abilities. Previous WM training studies with children found training-related performance improvements on untrained structurally similar WM tasks (near transfer), but also on dissimilar tasks tapping related abilities (far transfer). However, findings on far transfer effects are heterogeneous and existing studies are oftentimes hard to compare. We investigated the effects of WM training in middle childhood and tested whether training-related benefits generalized to other aspects of executive functioning (flexibility, inhibition) and reading ability. We investigated 97 participants (mean age=8.62 years, SD=0.55) in a controlled pretest-training-posttest design, including adaptive WM training (training group, n=47) and non-adaptive WM training (active control group, n=50). Participants performed 16 training sessions across six weeks. Pretest and posttest included measures of WM (complex WM span task), cognitive flexibility (card sorting task), inhibition (Go/Nogo task), and reading comprehension. We found significantly larger improvements in performance on the WM task and the cognitive flexibility task in the training group compared to the active control group, but no group differences for inhibition and reading comprehension. Overall, our results highlight the benefits of WM training and contribute to understanding the mechanisms underlying transfer effects.

Event--Related Potentials of the Semantically Informed Perception of Unfamiliar Objects

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Does our perception of an object change as soon as we discover what it is for? This question is relevant not only for our everyday lives, where we may encounter novel tools and gadgets as parts of our dynamic working and private environments; it pertains to the long-standing debate around the (im)penetrability of perception by “higher” cognitive capacities. In this experiment, we showed participants ($n = 24$) pictures of 120 unfamiliar objects either together with valid information about their function—leading to semantically informed perception—or together with invalid information—resulting in naive perception. We measured event-related potentials (ERPs) to investigate at which stages in the visual processing hierarchy these two different types of perceiving objects differed from one another. We found that semantically informed as compared to naive perception was associated with larger amplitudes in the N170 component and reduced amplitudes in the N400 component. When the same objects were presented once more (without any information), the N400 effect persisted and we now also observed enlarged amplitudes in the P1 component in response to objects for which semantically informed perception had taken place. We replicated these novel findings in an independent sample ($n = 24$). Consistent with previous work, they suggest that obtaining semantic information about previously unfamiliar objects alters aspects of their lower-level visual perception (P1 component), higher-level visual perception (e.g. holistic perception; N170 component), and semantic processing (N400 component).

De-prioritization of past selves even when past self-matching is not made harder by task demands

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The perceptual self-prioritization effect (SPE) is the observation that an arbitrary pairing of a geometric shape with a label can be matched more easily when said label refers to one’s own self, rather than another person or object. This perceptual matching task also produces comparatively high performance when labels denote a close other. While cognitive representation of past selves may resemble that of an intimate other in some respects, Golubickis et al. (2017) found no evidence for prioritization of past selves. However, their procedure required participants to discriminate between past selves during two distinct time periods within the same task. This raises the possibility that a potential past SPE was masked by increased task difficulty, selectively adding performance costs to the past self conditions. In our experiment, we addressed this potential confound by presenting a simplified task including only the usual number of three conditions (past self, present self, and stranger). We re-investigated the SPE in perceptual matching under conditions of mental time travel to the past. In line with the existing evidence, we found clear prioritization of the present self in matching performance, relative to either a past self or a stranger. Performance was consistently poorest in the past self condition, indicating not only an absence of privileged processing, but a potential relative de-prioritization. This observation is consistent with the findings reported by Golubickis et al. (2017). Performance was not affected by either the temporal proximity of, or by instructions to reminisce about, the time period in question.

What fixation durations reveal about the functional visual field and target guidance

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Concepts like the functional visual field (FVF) have been investigated to explain how many fixations are necessary to find a target and why observers sometimes miss a target even though their gaze fell close to the target position. Respective studies usually focus on the number of fixations or on saccade amplitude. In contrast, fixation durations received very little attention in the literature and are often assumed not to vary in a meaningful manner as a function of the current visual input. In the present study, we assume that the presence of the target within the FVF can speed saccade planning and that this registers in shorter fixation durations before a saccade is made to the target. We conducted a free viewing search experiment where participants had to find a specific target shape while target discriminability was manipulated. Results showed shorter fixation durations for the last distractor fixation before a saccade was directed to the target. Fixation durations are not shorter when target discriminability is low, suggesting that the subsequent target saccade is not guided by target information. Moreover, shorter fixation durations only occur when the fixation is within a specific distance to the target. We discuss whether fixation durations are only shortened by facilitated saccade planning when the target falls within the functional visual field. If so, fixation durations could be used to estimate the size of the functional visual field or more generally the span of the effective stimulus.

Insensitivity of metacognitive judgments to type of retrieval in an episodic lie generation task

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The current set of studies investigated the effects of lying on predicted and actual memory performance through cued-recall versus free-recall. The experiments consisted of four phases: Encoding, distraction, testing and truth-check. In the encoding phase, participants were presented with pictures depicting objects and events they might encounter in daily life and were questioned about the portions of the pictures they attended to. They were instructed to answer half of the questions by telling the truth and the other half by telling a lie, followed by their confidence ratings for remembering their answers on a subsequent test. After a short distraction phase, participants proceeded onto the testing. Experiment 1 used cued-recall, whereas Experiment 2 used free-recall. In truth-check phase, participants' memory for the truthful answer was checked through a cued-recall test. Results revealed that participants started answering faster in truth trials than lie trials both in Experiments 1 and 2. This difference was not reflected on predicted memory: participants predicted that they would remember their truthful and deceptive answers equally well. In Experiment 1, cued-recall memory performance was higher for truthful than deceptive answers. Experiment 2 revealed the opposite pattern: Memory performance was higher for deceptive than truthful answers when tested through free-recall. The results imply that the type of retrieval test used to prompt memory may change the pattern of actual memory performance for truth and lies, but the participants are not sensitive to the type of test in their memory predictions.

Studying a new animal welfare label – effects of framing on willingness to pay

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A new animal welfare label for meat products is being introduced by the German Ministry of Food and Agriculture (“staatliches Tierwohlkennzeichen”). The label emphasizes “more animal welfare” – but is this the right communication strategy? Previous research has shown that consumption of organic food is linked to both – universalism (“for the sake of the animals”) and security (“for the sake of my health”) values (Aertsens et al., 2009). In fact, personal / self-interested reasons are more relevant for many consumers (de Dominics et al., 2017).

To investigate this, we experimentally varied advertising messages framed to emphasize either security or universalism and we measured egoistic, altruistic and biospheric values (De Groot & Steg, 2007, 2008) as potential moderators.

Results showed a main effect of framing. Consumers were willing to pay more for meat with the new animal welfare label when the ad emphasized universalism. This main effect was, however, qualified by a significant interaction with consumers’ personal values. The positive effect of universalism framing on willingness to pay was significant for consumers with strong biospheric values, but there was no difference between the ads for consumers with weak biospheric values. There were no significant interactions with egoistic or altruistic values.

The current study has practical implications for marketing sustainable food products. Follow-up experiments will also study the effects of matching security and universalism frames with gain / loss arguments (e.g. Cesario, Grant & Higgins, 2004) and with color priming (red vs. green; Gerend & Sias, 2009).

Learning of metacognitive confidence judgements in an implicit learning situation

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In implicit learning tests, participants often have to judge whether a sequence of trials follows a previously learned sequence. In addition, they are often asked to rate how confident they are about their response in order to estimate whether their judgement (old/new) is based on explicit or implicit knowledge. These confidence judgements can be affected by knowledge about the underlying sequence or by other metacognitive heuristics such as perceived fluency. However, confidence judgements are usually only assessed after the decision (old/new) has been made. In the presented study, we assessed whether past experiences with perceived fluency affect the participants’ confidence predictions and how these predictions affect confidence judgements after the decision has been made.

Mechanisms and Modulation of Inhibition and Impulsivity

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Inhibitory control refers to the ability to suppress or stop unwanted responses, thoughts or emotions. Disinhibited behaviour has been linked with both impulsivity personality traits and clinical disorders such as substance abuse. Here, we discuss mechanisms of inhibition, relationships with impulsivity and ways to modulate performance in inhibitory and impulsive decision-making tasks. First, Ulrich Ettinger (Bonn) will introduce fundamental concepts in inhibition and impulsivity research, with a particular focus on the issue of heterogeneity in these constructs. Kaja Faßbender (Bonn) will present results on latent state-trait models of inhibitory control. Findings on the antisaccade, Eriksen flanker, go-/no-go, Simon, stop signal and Stroop task extend previous reliability analyses and provide further knowledge about similarities and differences between those tasks. Eduardo Aponte (Zurich) will introduce a computational model of inhibition in the antisaccade task (SERIA) and extend the model to the Simon task. Data from two independent studies provide evidence towards a unified account of response inhibition and conflict adaptation in these tasks and their modulation by lorazepam, a pharmacological agent known to impair inhibitory control. Kristof Keidel (Bonn) will present results on the network structure of impulsivity, confirming a high degree of heterogeneity within constructs subsumed under the term. He will also discuss framing effects in impulsive decision-making tasks. Volker Thoma (London) will talk about bilateral transcranial direct current stimulation (tDCS) to dorsolateral prefrontal cortex and performance in judgment and decision-making tasks with inhibitory demands. While anodal tDCS to right DLPFC increased cognitive reflection, logical thinking was reduced following anodal tDCS to left DLPFC. Finally, Carmen Weidler (Aachen) will discuss effects of prefrontal tDCS on response inhibition and reactive aggression in substance users. Results revealed improved response inhibition in alcohol dependent patients and chronic tobacco users following active but not sham stimulation. Overall, the symposium provides an overview of exemplary, state-of-the-art approaches to the study of the mechanisms and modulation of inhibition and impulsive decision making.

On the Relationship between Impulsivity and (Dis)Inhibition

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Inhibition is a term used to describe a range of mechanisms that, broadly speaking, serve to reduce neural, mental or behavioural activity. In this talk, I will focus on inhibitory control functions such as prepotent response inhibition and interference control, both of which are subsumed under the concept of cognitive control. Specifically, I will outline the experimental tasks typically employed to measure inhibitory control and I will address the issue of heterogeneity within this domain of cognitive control. Studies of correlations between different inhibitory control tasks have provided evidence of only small overlap, supporting the notion of heterogeneity. Further evidence of heterogeneity comes from pharmacological challenge studies that have shown drug effects on inhibitory control to be highly task dependent. For example, in a series of studies, we and others have investigated the effects of nicotine on inhibitory control. Whilst fairly consistent, beneficial effects of acute nicotine administration are observed on the rate of direction errors in the antisaccade task, effects on other inhibition-related measures are much less consistent or, for the stop signal task, dependent on levels of impulsivity in the sample. Whilst the latter finding provides evidence of a common neural substrate of impulsivity and inhibitory control, relationships between (dis)inhibition and impulsivity are not always consistent and well-powered studies of the relationship between (deficient) inhibitory control task performance and (high levels of) self-reported impulsivity yield at most small correlations. I will conclude by addressing some general recommendations for future research in the area of impulsivity and inhibition.

Discussion on Recent Advances in the Scientific Study of Consciousness

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In the final part of this symposium, I aim to stimulate and guide the discussion amongst all speakers and members of the audience on the basis of the presentations of this symposium. I will provide stimulation for the discussion by first reiterating definitions of the term consciousness and approaches to the scientific study of this complex concept. I will briefly review and integrate the findings presented by the speakers in this symposium with the aim to identify key themes in consciousness research and directions for future research.

The Impact of Context on Willingness to Pay versus Choice

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The influence of context on consumers' preferences is one of the most impactful findings in marketing and psychology. Prior research has investigated the impact of context on consumers' choices. However, it is unknown whether context similarly exerts power on consumers' valuations, which necessarily limits our understanding of the potential of context effects on firms' pricing strategy and, ultimately, their profitability. In this paper, we extend prior research by empirically investigating two context effects—attraction and compromise—using willingness to pay (WTP) as the elicitation method next to choice. We advance a theoretical account, value compatibility, which proposes that WTP (vs. choice) primarily reflects consumers' perceptions about the value of the alternatives in the marketplace rather than consumers' subjective valuations of the options. Consumers tend to indicate higher WTP for the alternative that is perceived to be more expensive in the marketplace, which is not necessarily the alternative that they choose. Consequently, value compatibility inspires different predictions about the impact of context on WTP versus choice. We empirically demonstrate the differential impact of context on consumers' WTP as opposed to choices in 8 pre-registered experimental studies. Our research offers a novel interpretation for research that uses WTP to understand consumers' preferences.

Quantifying cognitive load by combining eye tracking and EEG in a virtual reality environment

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Cognitive Load Theory by Sweller and Chandler (1991) attempts to quantify the extent of mental effort required during a working memory task. Despite ongoing research during the last decades with numerous methods such as reaction times, heart rate variability, and galvanic skin response, we still lack a reliable objective method for quantifying or measuring cognitive load. These methods are often used separately, with a clear lack of experiments that combine and compare them. We present a framework in which biological data can be recorded in a virtual reality (VR) environment. VR environments allow scalability into complex scenes while still providing good experimental control. In this methodological approach, we combine pupil dilation and electroencephalography (EEG) with behavioral data to estimate correlates of cognitive load in a working memory task. Our setup consists of a VIVE Pro headset with a built-in eye-tracking system to record pupil dilation and hand movement trajectories from the controller as well as a 32-channel EEG-system to record brain activity. We collect

and combine these bio-physiological markers using a within-subject design, resulting in a real-time estimate for cognitive load based on characteristic features of EEG frequency bands, and correlating them with variation in pupil size as well as behavioral data to indicate the amount of mental effort. Our goal is to improve the recording and analyses of cognitive load tasks or working memory tasks that manipulate cognitive load.

The intuition of deontological judgments: A meta-analysis

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Many ethical questions in society pose a conflict between deontological and utilitarian moral reasoning. While the former is guided by rather rigid rules (such as “Thou shalt not kill”), the latter favors actions that focus on the greater good (i.e., sacrificing one for many). The popularity of dual-process-frameworks, where decisions are attributed to either intuition or rationality, has also affected the domain of moral judgment research: some researchers argue that intuition favors deontological judgments, while deliberation leads to more utilitarian judgments. Moreover, several moderators of this effect have been proposed. For example, an action’s instrumentality or need for personal force may influence the effect of intuition manipulations on moral judgments. Our systematic meta-analysis of experimental studies investigates the cumulative evidence in favor of intuitive deontology as well as moderators of this effect. We will present our pre-registered procedure for study selection and coding of the relevant studies as well as first meta-analytic results. Furthermore, we will provide suggestions for future research investigating deontological versus utilitarian motives in moral judgments.

Latent State-Trait Modelling in Inhibitory Control

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Inhibitory control task performance has been shown to be stable and internally consistent. However, previous research has not formally quantified the extent of trait and state components in performance as well as possible trait changes over time.

N = 150 participants carried out antisaccade, Eriksen flanker, go-/no-go, Simon, stop-signal and Stroop tasks on three occasions. Latent state-trait modelling and latent growth-curve modelling was applied to estimate the amount of variance explained by trait effects and trait changes (consistency) and the amount of variance explained by situational effects and effects of situation x person interaction (specificity).

Trait changes existed for most models but were mainly relevant when comparing the first occasion to later ones. Mean reaction times (RT) for all tasks revealed high to excellent reliabilities (.86 – .99). Importantly, on average, 82% of variance was accounted for by consistency while specificity was rather small. Although inhibition-related variables clearly revealed lower reliabilities (.41 – .86), consistency again was mostly high. For congruency effects, 49 – 78% of variance in antisaccade error rate (ER) and no-go ER were accounted for by consistency, but for the stop-signal reaction time consistency only explained 18% of variance. Additionally, participants with large flanker effects, Stroop effects, no-go ER and saccadic latencies on the first occasion improved their performance more strongly over time.

We conclude that most inhibitory control variables represent highly reliable measures mainly affected by stable trait effects. When assessing inhibition related variables, especially in populations with reduced inhibitory control, it is recommended to aggregate multiple occasions.

Fingers tracking numbers: The use of Leap Motion to explore the functional link between fingers and numbers

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According to the Embodied Cognition perspective, the involvement of body parts influences the construction of numerical representations. Indeed, children's spontaneous finger use is a good predictor of their subsequent numerical abilities. The functional link between finger counting and numerical cognition is further supported by behavioral, neuroscientific and neuropsychological studies (e.g., Gerstmann syndrome) in adults.

A promising method to investigate the interaction between finger counting and numerical cognition involves the Leap Motion device, a hand motion tracker able to determine the user's finger configurations through optical sensors alongside an internal model of the human hand. The main advantage of this device is to be able to record continuous data while the hands move in space.

The semantic relationship between fingers and numbers is a fruitful field to explore the mental representation of numbers.

We show how cross-notation priming paradigms from Arabic numerals to finger configurations actively performed, both in real setting and virtual reality, are suitable experimental methods to understand how visual and motor aspects of finger counting contribute to the development of embodied numerical cognition.

Cognitive biases predict worry during examinations and COVID pandemic

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Worry is a stream of negative thoughts about future events and can be maintained by the consistent tendencies to attend to threatening information (i.e., negative attention bias) and to interpret ambiguities negatively (i.e., negative interpretation bias). At present, it is unclear whether memory bias under the influences of interpretations (i.e., interpretation-memory) is involved in the underlying cognitive mechanisms of worry, and how cognitive biases work together in association with worry. The nature of cognitive biases in predicting worry is also under-investigated. Besides, previous research has not identified whether the same cognitive biases predict worry when individuals cope with different stressors. To address these research gaps, the current research investigated what cognitive biases are associated with worry together (Study 1) by involving 64 first-year undergraduates in the study. We also investigated what cognitive biases predict worry when individuals faced examinations (Study 2, n=55), and when they were under the impact of COVID pandemic (Study 3, n=49). The findings showed that greater benign interpretation bias and interpretation-memory bias were associated with lower levels of worry. Only interpretation bias provided unique variance in worry, indicating that interpretation bias is the main factor contributing to the current worry. However, no cognitive bias provided unique variance in worry under examinations when initial worry was controlled (Study 2). When under the influence of COVID pandemic (Study 3), greater benign attention bias and interpretation-memory bias predicted lower worry levels. Both attention bias and interpretation-memory bias provided unique variances in predicting worry when initial worry was controlled.

Is the direction important? Spatial and stimulus influences on the joint flanker effect

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People continuously interact with other individuals. Previous studies on joint action observed compatibility effects in different interference paradigms such as the Eriksen flanker task. Here, the performance was improved when the target stimuli and the irrelevant flanker stimuli were compatible relative to incompatible trials (known as the flanker effect) if two co-actors share the task (joint flanker task). Smaller effects were obtained when one actor worked on the task alone (individual flanker task).

The present study investigated the influence of stimulus material (letters vs. arrows) and actor's seating position (left vs. right) using a flanker task under two different task setups (individual vs. joint flanker task). By using arrows, spatial information were added to a originally none spatial task. The actor's seating position was either compatible with the arrow's pointing direction or not. This design allowed us to disentangle between the influence of spatial information (arrow stimuli) and social influences (letter stimuli).

Our results showed that the size of the flanker effect was modulated by stimulus material used indicating larger flanker effects in arrow trials compared to letter trials. The presence of the co-actor (task setting) as well as the co-actor's seating position did not modulate the flanker effect. This study was able to proof spatial influences on the Eriksen flanker task. However, the otherwise dependable joint flanker effect was not found.

Underlying Mechanisms of Strategic Decision Making

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In many societal problems, individuals exhibit a conflict between keeping resources (e.g., money, time or attention) to themselves or sharing them with another individual or group. The reasons motivating decisions in favor of others welfare can thereby vary from purely altruistic to completely strategic. Be it the stranger making an effort returning a lost valet to its rightful owner or a co-worker pitching in her fair share in a joint project. Actions like that create an environment that makes living together a pleasant experience. Hence, understanding how decisions determining the welfare of oneself and others are made is important for facilitating this behavior by building institutions that maximize the rate of cooperation in a society. To shed new light on such decision making processes I will present recent evidence from a set of process tracing experiments utilizing eye-tracking and economic games. Experiments will focus on the role of social preferences in the choice construction process and will identify mechanisms (i.e., search and processing depth, information weighting, and ignorance) through which they guide choice behavior. I will in particular focus on the differences and commonalities between strategic and altruistic decisions. Specifically, investigating to which extent people direct attention towards certain components of the decision situation in a context-dependent manner.

Advance in TVA-based visual attention research - part II: Clinical profiles, effects of manipulations and neural correlates

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The application of report tasks and modelling based on Bundesen's theory of visual attention (TVA) offers the unique opportunity to assess and parameterize multiple critical visual attention functions in process-pure, independent manner. In talks presenting TVA-based patient studies, Gillebert et al. characterize the attentional profiles of stroke patients assessed with TVA-based bedside testing, Bublak et al. define the relationship of attentional parameter changes in multiple sclerosis to visual functions and Kattlun et al. demonstrate the consequences of severe sepsis. Wagner et al. show the effects of long term monocular deprivation in normal participants and Finke et al. focus on the relationships between visual processing speed and white matter brain age.

Relationship between brain age and visual processing speed

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It has been proposed that the brain age gap estimation (BrainAGE) method of white and grey matter structures serves as a neural biomarker of cerebral aging, while parameters derived from a whole report paradigm based on the theory of visual attention (TVA) might reflect the individual functional aging. However, hitherto, the relationship of TVA-derived parameter estimates with brain age still remains to be established. Thus, we assessed, in 44 younger (<50 years) and 47 older (≥50 years), whether and how visual processing speed and visual working memory capacity, as two major parameters derived from TVA-based whole report assessment, are related to individual estimates of white and grey matter brain age. We found that in older, but not younger, adults, visual processing speed was negatively related to white matter brain age. Thus, in aging individuals, younger biological age of white matter brain structures is related to faster attentional processing.

Serial dependence in visual working memory: cognitive and neuronal mechanisms

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The processing of a visual object can be systematically biased towards an object that was processed several seconds ago. This phenomenon, called serial dependence, has been thought to promote an object's stability by compensating for small changes of its appearance over time. Up until now, it has been debated whether this attractive bias occurs at perceptual or post-perceptual levels of the processing hierarchy. To address this issue, we recorded neuronal activity using MEG while participants remembered motion directions of two sequentially presented red and green items. After a delay, a colored retro-cue indicated the item whose motion direction participants had to report. We observed that the currently reported motion direction was biased toward the item retro-cued on the previous trial. This bias was present when the current and the previous item's motion directions were similar to each other and further increased when items shared the same color. This replicated our recent results (Fischer et al., 2020). Using an inverted encoding model, we could reconstruct the motion direction from the MEG signal of both items in the current trial. The reconstruction was perfectly aligned to the

actual motion direction at time-points when the corresponding item was presented and memorized. Our preliminary analyses also showed that after the retro-cue, the reconstructed signal was slightly shifted towards the direction of the item retro-cued in the previous trial. This suggests that serial dependence operates when an item is accessed in working memory rather than when it is perceived or memorized.

Fine Motor Skills and their association with Early Literacy and Numeracy

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Previous studies suggest that different facets of fine motor skills are associated with precursor skills of literacy and numeracy during early childhood: Associations were observed between graphomotor skills and phonemic awareness, dexterity and receptive vocabulary, dexterity and counting skills, and finger agility and calculation skills. In this study, these findings were integrated by relating different fine motor skills to different precursor skills. We expected associations between (a) graphomotor and literacy skills, (b) finger agility and numeracy skills, and (c) dexterity and both literacy and numeracy skills; even when controlling for other cognitive abilities.

In a within-subject design, preschool children (N = 107, 53 girls) aged 4-6 years (M = 5;3 years, SD = 8 months) were tested on their fine motor skills (graphomotor skills, dexterity, finger agility), literacy skills (phonemic awareness, vocabulary), numeracy skills (magnitude comparison, counting), and control measures (general cognitive skills, working memory). Correlation and regression analyses predicting the three fine motor skills were conducted.

When all variables were entered into the regression analyses, finger agility was associated with literacy, age, and verbal working memory; whereas dexterity was associated with numeracy and age. In contrast, visuomotor skills were associated with age and general cognitive skills, but neither literacy nor numeracy.

Although confirming that different facets of fine motor skills are associated with precursor skills, the findings do not concur with previous research. Possible explanations and avenues for future research will be discussed.

DNNs for color classification and color constancy

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Color constancy is our ability to perceive constant colors across varying illuminations. Here, we trained deep neural networks to recognize 1600 surface colors consistently under a large set of natural illuminations, thus teaching them both about color discrimination and color constancy simultaneously. Inputs to the networks consisted of 3D-rendered images, converted into cone excitations, using 2115 3D-shapes, 1600 Munsell reflectances and 278 different natural illuminations. Testing was done with 4 new illuminations with equally spaced CIEL*a*b* chromaticities, 2 along the daylight locus and 2 orthogonal to it. All of the networks exhibited supra-human degrees of color constancy, with color constancy index values higher along the daylight locus than along the orthogonal direction, comparably to observations made in human studies. Similarly, when gradually taking cues away from the scene, constancy also decreased. Different networks, however, represented colors differently: while DeepCC, a convolutional network, represented colors along the 3 major dimensions of human color vision, our custom ResNet showed a more complex and difficult to interpret representation. Our work shows that the combination of advanced computer graphics and deep neural networks, along with detailed

comparisons to behavioral experiments, provides an exciting platform for modeling complex visual tasks like color constancy.

Binding for action slips

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Humans rely on a powerful mechanism to control their actions – they bind features of their response to features of the concurrent stimulation, allowing for seamless access of that response upon re-encountering the same situation. Current theorizing confines this integration process to successful action episodes. This traditional view therefore suggests that binding is switched off when actions go awry, taking no active part in error processing. We instead propose that binding is also effective for action slips, i.e., unintended, erroneous responses. The results of sequential analyses of erroneous action episodes in our experiments support the view that correct and erroneous episodes enter adaptive bindings that promote successful actions in the future. This finding qualifies binding as an immediate measure to learn from errors.

Goal-Directed Suppression of Visual Attention

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Research suggests that active feature suppression could contribute to visual selective attention. For instance, knowing what not to look for benefits visual search, as foreknowledge of or prolonged experience with to-be-ignored features decreases distractor interference. Using a cueing protocol, we investigated whether distractor colors are indeed actively suppressed or simply ignored. First, we ensured that color suppression was not only beneficial, but even necessary to find the targets. Secondly, we compared effects of suppression to that of merely ignoring a task-irrelevant feature. Our participants searched for a negatively defined target, for instance, a non-red horizontal bar, while the actual color of the searched-for target was unknown to the participants. Critically, searching solely for target orientation or for target color was not possible, as each target display contained two lines of the target's orientation—for instance, two horizontal bars—, one of which had a to-be-ignored color and the other line (the target) had a variable and unknown alternative color. We found that participants were able to search for the negatively defined targets and that “negative” distractor colors were actively suppressed: Search times were significantly slower when a cue with a “negative” color preceded the target at the same position compared to a different position, indicating feature-based suppression. Notably, cues with a task-irrelevant color (that was neither a target nor a distractor color) were simply ignored, indicating a difference between active suppression and passive ignoring. Our results suggest that active suppression is a top-down attentional guidance principle, supporting visual search.

Perceptual Latencies of Object Recognition and Affect Measured With the Rotating Spot Method

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According to the semantic primacy hypothesis of emotion generation, stimuli must be semantically categorized to evoke emotions. This hypothesis was tested in two chronometric studies, using the rotating spot method of timing subjective events. Participants saw pleasant and unpleasant pictures while a spot rotated around the edge of the picture. In different blocks of trials, they indicated when they experienced the pleasant or unpleasant feeling evoked by the picture, and recognized the depicted object, by reporting the position of the spot at the time when these mental events occurred. In both experiments, the latency of object recognition was shorter than the latency of affect for nearly all participants and pictures, and the two latencies were positively correlated across participants. Experiment 2 additionally showed that an experimental manipulation that delayed object recognition, blurring the pictures, also delayed the onset of affect. A mediation analysis suggested that this effect was at least partly mediated by the delayed recognition of the objects. The findings support the semantic primacy hypothesis.

Movement analysis of flatworms

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Flatworms are early bilateralians featuring a structured nerve system with a tendency towards cerebralization. They represent one of the evolutionary oldest brains currently present on the planet. As a preparation of the study of the cognition of these animals we want to characterize their movement and compare it to simulations based on a random walk model.

We have developed a camera system and a tracking software which provides localization information on a frame-by-frame basis. We collected movement data for hundreds of sessions where a flatworm (*Schmidtea mediterranea*) was put in the middle of an evenly illuminated plane offering no clue on an advantageous direction where to go. In such a situation an unbiased random walk would be an efficient strategy to explore the terrain.

We have developed a random walk model of flatworm movements based on a diffusion coefficient describing the mobility of the flatworm and a relaxation time describing the inertia of its movement. We collected movement data from simulated flatworms and compared them to movement data of real flatworms. Apparently, the movement data of real flatworms can be described by the same movement parameters that were implemented in the simulation. Whatever was going on in their head, it looks like the flatworms attempted to explore the terrain by means of an unbiased random walk.

The Impact of Media Sign Literacy and Symbolic Understanding on Children's Development of Metaphor Comprehension

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This study examined the relation between media sign literacy, symbolic understanding, and metaphor comprehension. Its aim was to consider the impact of media sign literacy as a symbolic skill on metaphor comprehension. In the study, 129 children aged 4 to 7 completed a measurement designed to assess symbolic and metaphoric understanding. Media sign literacy was evaluated by a computer-based test. Intelligence and linguistic competencies were considered as further variables. Participants were divided into four groups: pre-preschool, preschool, first grade, and second grade. The results show a continuous growth of media sign literacy as well as symbolic and metaphor comprehension with age, particularly during the transition from preschool to first grade. A regression analysis showed that after age, symbolic understanding and media sign literacy are significant predictors of metaphor comprehension. In contrast to previous findings, intelligence and linguistic abilities had no significant effect. In particular, media sign literacy has a precursory function in the acquisition of metaphor comprehension. A path analysis concretizes the function of media sign literacy in the acquisition of metaphor comprehension, mediating the relation between intelligence, linguistic competencies, symbol understanding, and metaphor comprehension.

Investigating honesty contracts as a new method to control social desirability bias

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The validity of surveys asking for self-reports of sensitive attributes is threatened by socially desirable responding. To reduce social desirability bias we propose honesty contracts as a new method that can be added to any survey. Honesty contracts are based on placing an explicit contract with voluntary respondents who are asked, prior to the survey, whether they want to commit themselves to provide honest answers. The honesty contract increases attention to honesty norms and avoids the problem of participants skipping instructions. Participants who agree to the honesty contract are also bound to respond more truthfully through self-commitment, as their decision regarding the contract is voluntary. To investigate whether honesty contracts are actually capable of reducing socially desirable responding, we conducted two experiments. In the first experiment we asked participants to provide self-reports regarding nine socially undesirable behaviors, as for example driving a car after consuming alcohol, lying to other people, and shoplifting. As expected, respondents in the honesty contract condition were significantly more ready to admit socially undesirable behavior than respondents in the control condition. A second experiment replicated the findings of the first experiment while also employing an additional control group, which received instructions simply asking for honest responding without stating a contract. Increasing attention to honesty norms alone was not sufficient to reduce social desirability. Taken together, our results suggest that concluding honesty contracts reduces response distortions due to social desirability based on mechanisms that go beyond increasing the salience of honesty norms.

Dissociating stimulus-response compatibility and modality compatibility in task switching

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Modality compatibility describes the similarity between the modality of the stimulus and the modality of the anticipated response effect (e.g., auditory effects when speaking). Task switching between two incompatible modality mappings (visual-vocal and auditory-manual) typically leads to larger costs than switching between two compatible modality mappings (visual-manual and auditory-vocal). However, it is unclear whether the influence of modality compatibility arises before or after task selection, response selection, or affects both processes. We investigated this issue by introducing a factor known to influence response selection, stimulus-response (S-R) compatibility, examining possible interactions with modality compatibility. In Experiment 1, stimulus location was task-irrelevant; participants responded manually or vocally to the meaning of visual and auditory colour words presented left or right (Simon task). In Experiment 2, stimulus location was task-relevant; participants responded manually or vocally, indicating the location (left or right) of visual or auditory stimuli, using a spatially compatible vs. incompatible mapping rule (“element-level” S-R compatibility). Results revealed independent effects of S-R and modality compatibility in both experiments (n = 40 per experiment). Bayes factors suggested moderate but consistent evidence for the absence of an interaction. Independent effects suggest modality-compatibility effects arise either before or after response selection, or possibly both. We propose that motor response initiation is associated with anticipatory activation of modality-specific sensory effects (e.g., auditory effects when speaking), which in turn facilitates the correct response in case of modality-compatible mappings (e.g., auditory-vocal) or reactivate, at the task-selection level, the incorrect task in case of incompatible modality mappings (e.g., visual-vocal).

Perturbation of the right prefrontal cortex disrupts interference control

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Resolving cognitive interference is central for successful everyday cognition and behavior. The Stroop task is a classical measure of cognitive interference. In this task, participants have to resolve interference on a trial-by-trial basis and performance is also influenced by the trial history, as reflected in sequence effects. Previous neuroimaging studies have associated the left and right prefrontal cortex with successful performance in the Stroop task. Yet, the causal relevance of both regions for interference processing remains largely unclear. We probed the functional relevance of the left and right prefrontal cortex for interference control. In three sessions, 25 healthy participants received online repetitive transcranial magnetic stimulation (rTMS) over the left and right dorsolateral prefrontal cortex, and sham stimulation over the vertex. During each session, participants completed a verbal-response Stroop task. Relative to sham rTMS and rTMS over the left prefrontal cortex, rTMS over the right prefrontal cortex selectively disrupted the Stroop sequence effect (i.e., the congruency sequence effect; CSE). This effect was specific to sequential modulations of interference since rTMS did not affect the Stroop performance in the ongoing trial. Our results demonstrate the functional relevance of the right dorsolateral prefrontal cortex for the processing of interference control. This finding points towards process-specific lateralization within the prefrontal cortex. The observed process- and site-specific TMS effect provides new insights into the neurophysiological underpinnings of Stroop task performance and more general, the role of the prefrontal cortex in the processing of interference control.

BRAC-Introduction and Overview

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Human action control relies on representations that integrate perception and action, yet the relevant research is scattered over various experimental paradigms and the theorizing is overly paradigm-specific. To overcome this obstacle, we proposed BRAC (Binding and Retrieval in Action Control), an overarching, integrative framework accounting for a wide range of seemingly unrelated findings by assuming two core processes: feature binding and retrieval. In contrast to previous approaches, we define binding and retrieval as functionally different, separable processes, independently contributing to observed effects. Furthermore, both processes are independently modulated by top-down and/or bottom-up processes. BRAC organizes the literature on action control in novel ways and relates various, independently investigated action-related phenomena from different research fields to each other

You can't always get what you want: When persistence in task choice requires increased flexibility

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Goal-directed action in an ever-changing environment requires a dynamic balance of cognitive stability and flexibility. The voluntary switch rate (VSR) in voluntary task switching paradigms allows investigation of this balance. A high VSR indicates flexibility and a low VSR stability. Previous studies showed a regulating influence of reward: If reward prospect increases, flexibility increases (increased VSR). If reward prospect remains high, stability increases (reduced VSR). The double-registration voluntary task switching paradigm separates task selection from task processing. This allows to investigate the stability of goals besides measuring the VSR. To this end, in rare cases a response to the non-selected task is required after task selection. A first experiment with such expectation violations showed an opposite modulation of the VSR by reward: VSR was lowest for increasing reward and highest for remaining high reward. The high VSR could be due to a persisting goal (the task is selected again after prevented execution in the previous trial). But a general increase in behavioral flexibility cannot be excluded. Therefore, a follow-up experiment with three tasks was conducted. After an expectation violation, remaining high reward did not generally increase switching, but increased the choice repetition rate of the task that was prevented from execution. The high VSR is thus due to greater persistence in task choice rather than a general increase in behavioral flexibility. Hence, cognitive stability in goal pursuit is not necessarily associated with behavioral rigidity. Instead, this indicates that flexible behavior can serve persistent goal pursuit.

“Eccentric, effeminate and superficial” – Sexual Orientation Prejudice across Cultures

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Sexual stereotyping remains a major issue in Western societies despite the increasing number of LGBTQ+ anti-discrimination laws. Negative consequences for people who are perceived as “different” from the “norm” arise from more or less negative evaluations (NE). Theoretically, one possible explanation is that homosexuality is perceived as a threat to hegemonic masculinity. The latter can be regarded as culturally shaped by belief systems that value masculinity to different degrees. NE are even increased when certain social groups carry multiple stigmata such as “non-conform” sexual orientation and migration status. This applies to a significant part of European citizens, e.g. to French individuals from Maghrebian origin in France.

Our study reports results from an experimental study investigating NE of homosexual males and females using spontaneous speech samples from an oral corpus of French discourses. The data has been elicited with the help of different pictures showing two males and/ or two females unambiguously kissing each other. Participants (N=149 women, N=183 men; Mean Age= 26 years, SD= 5.2; range: 19-42 years) varied in their sexual orientation (homosexual vs. heterosexual) and cultural background (French vs. Maghrebian). Their task was to describe freely what the picture evoked to them.

Subsequently, the data has been manually transcribed and analyzed combining sentiment-analysis with discourse-analytical approaches. Preliminary results revealed the different degrees to which homosexuality is more or less negatively valued across cultures. The findings therefore suggest a strong culture-dependency of sexual stereotyping and might contribute to answering the open question of why, ultimately, sexual stereotyping still exists.

Do DNNs perform closed contour detection tasks similarly to humans?

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Closed contours are thought to be prioritized by the human visual system and to be important in perceptual organization. To tell if a line closes up to form a closed contour, humans are believed to implement a process called “contour integration” that relies at least partially on global information. Deep Neural Networks (DNNs) on the other hand are believed to process mainly local information and thus we hypothesized that they might have difficulties in distinguishing closed from open contours. Surprisingly, though, we find in our experiments that our DNN can in fact separate images containing a closed contour from images containing no closed contour. It could have been enticing to infer that the model would have learned the concept of closedness and possibly that it performs a similar contour integration-like process as humans. However, additional experiments and analyses show that this interpretation would have been overhasty. For one, generalization tests show that our DNN does not succeed on some variations of the data set that are still clear to humans. Secondly, we identify local features in the data set that can be used to perform well on the task suggesting that alternatives to the human global contour integration procedure are possible.

Overall, assessing whether DNNs solve tasks in ways similar to humans can be challenging. This work shows how human bias can affect how we interpret results, and that several analytic tools can help to overcome this human reference point.

In the mind – linking inner speech, attentional control, and every day cognitive failures

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Mental activities such as inner speech (i.e., silently rehearsing instructions), mind wandering (i.e., taking time off from monotonous or effortful cognitive activities) and daydreaming (i.e., imaging oneself in the forest) and their impact on goal-directed behaviour have recently attracted much interest. Beneficial effects of motivational and evaluative inner speech have been reported for the Simon and the arrow flanker tasks, in that more engagement in habitual inner speech led to a reduction in conflict effects. Conflict effects reflect the difference between congruent and incongruent trials. In this work, we expanded our focus and investigated the impact of inner speech on a larger time scale, namely everyday cognitive failures such as ignoring travel signs or forgetting names as measured in the cognitive failure questionnaire (Broadbent et al., 1982). Analysing the data of >100 participants collected in an online survey comprising the Simon and flanker task as measures for attentional control, we used a hierarchical drift diffusion modelling in addition to hierarchical linear regression to replicate and extend former work (Gade & Paelecke, 2019). Preliminary analyses show high correlation across constructs assessed and reliable interference effects but require further substantiation as data collection is ongoing.

All-or-none strategy change in abandoning instructions in a traffic light setup

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While instructions can initially determine how we represent and control a task, learning can lead to changes in task representation and performance. Studying how this change occurs informs theories of action control and is relevant in applied settings. Often instructed and other features co-vary in the environment. For instance, at traffic lights instruction-based response selection (respond to color of light) can be accompanied or substituted by covariation-based response selection (respond to position of light). If people can voluntarily control whether or not they change from the instructed to an alternative strategy, abandoning the instructed task-set should be impeded by interspersing more catch-trials breaking the covariation. In an online experiment [see a demo at <https://psychexphagen.fernuni-hagen.de/Experimente/Ampel/index.html>] with N=264 participants we varied whether during training there was no, infrequent or frequent deviation from the covariation between color (magenta/cyan) and stimulus position of a cloud of color dots (upper/lower) and the response keys ([c]/[m])). In line with the view that strategy change is under voluntary control, we observed that higher amounts of deviants reduced the proportion of participants applying the alternative strategy – rather than influencing how strongly individual participants used the alternative strategy.

Memory Retrieval in Attitude Formation

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In five experiments, we tested the hypothesis that attitudes are influenced by reactivating explicit memory of valent information that was experienced together with the attitude object. In Experiment 1, an evaluative conditioning effect was moderated by the presentation of the US as a retrieval cue in a design that precludes valence priming effects. In Experiment 2, a similar design was adapted for learning attitudes based on behavioral descriptions. In this study, attitudes were moderated by reactivating the behavioral descriptions. Experiment 3 showed that a similar moderation effect as in the previous experiments occurred after previous learning of both positive and negative information. In Studies 4 and 5 we investigated the influence of reactivated memory in the liking of everyday objects. It was shown that the valence of a retrieved memory associated with an everyday object is more strongly related to the liking of this object after than before this memory retrieval. These studies show that not only the knowledge of related evaluative information, but also their recent reactivation is relevant for expressed attitudes towards objects and persons.

Persuading hospital visitors to perform hand hygiene

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Hospital visitors pose a risk of transmitting pathogens that can result in nosocomial infections. Using alcohol-based hand-rub is the single most effective method to reduce the transmission risk. However, a majority of visitors do not clean their hands during their stay at a hospital. The present study aimed to evaluate an evidence-based intervention to improve visitors' hand hygiene behavior through persuasive signs. For the 14-week-long field experiment, seven signs were designed according to Cialdini's principles of persuasion: reciprocity, consistency, social-proof, unity, liking, authority, and scarcity. These principles have been successfully applied to change human behavior in many different settings. Each sign was displayed on a TV-screen for one week directly above the hand-rub dispenser in a hospital lobby. Between each posting, the screen was blank for one week. Visitor traffic and dispenser usage in the lobby was recorded via an electronic monitoring system. Overall, 246,098 entries and exits and 17,308 dispenser usages were recorded. During the blank control weeks, the dispenser usage did not vary significantly. The signs based on the authority and the social-proof principles significantly increased the hand-rub dispenser usage rate in comparison to the average baseline usage rate. These findings indicate that the principles of persuasion can be easily and cost-efficiently translated and implemented to initiate behavior change in health-care settings. Theoretical and practical implications of these findings are discussed.

Comparing different modalities of partial item repetition with regard to subsequent memory performance

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Repeating a subset of studied items can lead to subsequent forgetting of non-repeated items. The aim of the present study was to compare different modalities of item repetition (retrieval, restudy, recognition, part-list cuing) as directly as possible. In three cycles, participants memorized three word lists (one list per cycle), each containing six target and ten non-target items. This was followed by a test, with target recall being the variable of interest. The following conditions were compared: in a

retrieval condition, target recall was always preceded by letter-cued retrieval of non-target items. In a control condition, target recall took place directly, without prior non-target retrieval or repetition. In a restudy condition, non-targets were repeated after the initial memorizing phase. In a recognition condition, non-targets were repeated as well, except that now participants were asked to indicate whether they had previously memorized a respective word or not. In a part-list cuing condition, non-targets were again repeated. This time, however, participants were asked to use them as a reminder for subsequent target recall. Results indicated an overall effect of item-repetition on performance in target recall. The strength of impaired target recall depended on the modality of non-target repetition.

Jack does sports. Will he gain weight? Prior knowledge and the specificity of conditionals

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When people reason with conditionals, they usually consider their prior knowledge and defeat conclusions they would draw otherwise. It has been shown, though, that this spontaneous consideration of prior knowledge can be suppressed when the conditional contains a specific name (e.g., “If Jack does sports, then Jack loses weight”) compared to when the conditional is phrased in an unspecific way (e.g., “If a person does sports, then the person loses weight”). Typically, participants accept more conclusions for specific compared to unspecific conditionals. We refer to this as the specificity effect. But can specific conditionals also elevate the acceptance of counterintuitive or even arbitrary conditionals? We present two experiments in which we systematically varied the specificity of counterintuitive (Experiment 1) and arbitrary conditionals (Experiment 2). Counterintuitive conditionals contained consequents that were the opposite of what could be expected according to prior knowledge (“If Beth/ a person brushes her teeth, then Beth/ the person gets cavities”). Arbitrary conditionals contained antecedents and consequents that had no connection to prior knowledge (“If Anne/ a person takes a bus, then Anne/ the person wears a blue pullover”). All conditionals were embedded in valid and invalid inferences and participants had to evaluate the conclusions on a 7-point Likert scale. We found specificity effects in both experiments, i.e., participants gave higher acceptance ratings for inferences with specific than with unspecific counterintuitive and arbitrary conditionals. Our findings show how even small variations in the phrasing of conditionals can affect reasoning.

The accuracy of people’s confidence in discerning true from false news

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False news can harm science, society, and democracy, with false content diffusing faster and deeper on social networks than (some) true news. While discerning truth from falsehood online is fundamental, people’s confidence in their truth judgments crucially influences how likely they are to act on and defend their beliefs. Here we assess the accuracy of confidence in discerning true from false news headlines in an online US sample (N = 157; Prolific). In a first study, we presented participants with 24 real news headlines as they would appear on a Facebook news feed (i.e., image, headline, and source); 12 were accurate and 12 were inaccurate. For each headline, respondents evaluated the accuracy of the headline (accurate vs. inaccurate) and how confident they are that their decision was correct (subjective probability: 50-100%). Preliminary analyses investigated participants’ AUC, that is, the extent to which confidence discriminates between correct and wrong decisions. We find that participants showed, on average, reasonable accuracy of confidence, but also strong interindividual differences (AUC; median = .65, 95% CI: .63-.68, middle 80%: .46-.84). Moreover, participants showed

lower AUC for false relative to true items, with a substantial proportion of participants falling below chance level for false items. This suggests that some participants may be led astray by incorrect confidence in false items.

Binding under light: An fNIRS study to the prefrontal neural correlates of response-response binding

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Whenever we initiate an action this action as well as certain aspects surrounding the action are integrated into an event file. When the surrounding of a subsequent action shares features with that of the initial action, these event files are retrieved and may influence the current action. This so termed binding and retrieval is a key feature of human action control. While the behavioral implications as well as the limitations of binding have been rigorously explored, so far, research on its underlying neural processes is sparse. One reason for this is that several features in an event file deteriorate rapidly which makes it hard for imaging methods like functional magnetic resonance imaging and functional near-infrared spectroscopy with medium temporal resolution to detect binding. We explored comparatively time persistent response-response bindings with functional near-infrared spectroscopy. We measured binding related neural activity during prime and probe trials in the dorsolateral prefrontal cortex, a crucial area for action control. Analogues to behavioral observations, we expected that a complete repetition of a previous event should lead to facilitated processing and thus low dorsolateral prefrontal cortex activity while a partial repetition should lead to interference between the pre-formed event file and the current action plan and thus heightened dorsolateral prefrontal cortex activity.

Phonologically reduced speech sounds interfere with verbal but not with phonological short-term memory: Further support for the phonological-interference hypothesis

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While performing a cognitive task, irrelevant background speech disturbs certain cognitive functions (Irrelevant Speech Effect). At TeaP 2020 we reported that speech sounds (e.g. "beh, tie, peh, buh, ...") are more disruptive in a visually presented verbal short-term memory task than non-phonological sounds, and we attributed this effect to the reduced phonology in the non-speech sounds. To test this phonological-interference hypothesis, we decided to vary systematically the phonological characteristics of background sound and cognitive task to be performed.

In one experiment (n=30), we examined the effects of phonological and phonologically reduced syllable sounds on both verbal and phonological short-term memory. Verbal memory was operationalized by a serial recall task presented via easy to verbalize images, e.g. "mushroom", "moon". Similar images were used to present the phonological memory task. Here the outlier next to paired images beginning with the same initial word sound had to be memorized, e.g. "c-amera" as an outlier next to "h-orn" and "h-oney". Spoken syllables were played-back as phonological sound; phonologically reduced sound was derived from the spoken syllables by sinewave synthesis (sinewave speech). Sinewave synthesis keeps the temporal-spectral complexity of the original sound while reducing its phonological characteristics.

Our results show, that the syllable sound (phonological sound) reduced performance in both tasks. Non-phonological sound (sinewave speech), however, only reduced performance in the verbal but not in the phonological short-term memory task. Thus, our results support the assumption that the lower disturbance impact of sinewave speech on verbal short-term memory is based on the reduced phonology.

Early and late ERP correlates of attention to specific levels of the valence of emotional words

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Attention to affect profoundly alters the processing of affective stimuli. However, until now tasks requiring attention to a specific level of affect (e.g., positive) while ignoring others (e.g., negative, neutral) were employed surprisingly rarely. In an event-related potential (ERP) study using 64-channel EEG, N=57 participants were asked to press a button whenever the presented adjective fell in the current target category of valence (positive, negative, or neutral). Target level of valence was manipulated block-wise. Going beyond most previous ERP studies, we could examine target status X affect interactions. We expected to find target-related boosts of well-known ERP correlates of affect, such as increased late positive potential (LPP), and/or novel effects specific to attended levels of valence. Four ERP valence effects were independent of target status: reduced right parietooccipital P1 and increased medial parietooccipital N2 for negative words; increased parietooccipital left-right lexical asymmetry at around 250 ms for emotional words; more positive parietal ERPs for positive than negative words in a component-overarching interval from 250 to 650 ms. Two ERP valence effects were restricted to words matching the current target level of valence: Left-lateralized relative N94 increased from negative over neutral to positive words. While centroparietal LPP was generally larger for emotional than neutral words, there was also a target-related, left-side boost of this LPP arousal effect. The present findings confirm the usefulness of a level-specific manipulation of attention to affect. This type of attention increases both implicit (N94) and explicit (LPP) processes of affective discrimination in the brain.

Binding and Retrieval in Action Control, part 1: Characterizing binding and retrieval

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Research on human action is distributed across diverse scientific communities, each of which comes with specific experimental paradigms and corresponding theorizing. The BRAC framework (Binding and retrieval in action control) provides a domain-general perspective to bridge these fields by proposing feature binding and retrieval as two basic, functionally separable processes that underlie a broad range of phenomena. The symposium brings together new advances in specifying the BRAC framework regarding triggers for binding and retrieval, regarding the impact role of top-down vs. bottom-up factors on both processes, as well as regarding the relation of binding to long-term learning. These findings underscore the framework as a theoretical hub to structure the vast literature on perception, action control, and beyond.

Binding and Retrieval in Action Control, part 2: Event Segmentation and Long-Term Learning

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Smaller than expected: Effects of imitative action regulation after experiencing social exclusion

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In two pre-registered studies, we investigated whether processes of imitative action regulation are facilitated after experiencing an episode of social exclusion. We reasoned that imitative action regulation effects should be more pronounced for participants who were socially excluded, providing them with an “automatic means” to socially reconnect with others. Participants played a virtual ball-tossing game to experimentally induce social exclusion or inclusion experiences. Subsequently, pairs of two participants engaged in an observational S-R binding paradigm modeled after Giesen et al. (2014): Participants observed color categorization responses in their interaction partner (trial_{n-1}) and then executed (in-)compatible responses in the subsequent trial (trial_n), with observation and responding occurring in alternation. Stimulus relation (repetition vs. change) from trial_{n-1} to trial_n was orthogonally manipulated. In both studies, stimulus-based retrieval effects of observationally acquired SR bindings were descriptively larger in socially excluded (compared with socially included) participants. However, none of the effects were statistically significant. Even a joint analysis of both experiments did not show the expected modulation. Our findings suggest that the impact of social exclusion experiences on imitative action regulation processes ranges in the realm of small effect sizes, requiring very large sample sizes to yield significant findings. Implications for the study of imitative action regulation processes are discussed.

TVA-based assessment of inattention in stroke patients: moving from bench to bedside

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Since the first publication of the Theory of Visual Attention (TVA) by Claus Bundesen in 1990, various studies have used this computational framework to characterise visual attention in healthy individuals, as well as visual inattention in clinical populations. TVA-based assessments have the advantage of being highly sensitive and relying on accuracy rather than fast motor responses, making them suitable for a wide variety of neurological and psychiatric patients. However, the implementation of

experimental paradigms to clinical practice faces several challenges in terms of accessibility to specialized infrastructure, and inclusiveness of participants. In this talk, I will discuss novel implementations of TVA-based assessment aimed at increasing the translation of this tool to clinical settings. More specifically, we examined the reliability of a TVA-based assessment on a mobile and light-weight portable tablet device, as well as a TVA-based assessment with stimuli that were not alphanumeric, but based on line-drawings of fruits and vegetables. Our results suggest that TVA-based assessment may be a promising and accessible tool to acquire sensitive clinical measures of visual attention at the bedside of the patient, and can also be used in individuals who experience difficulties processing letters and/or numbers.

Learning Induced Changes in Cortical Resting-State and Task-Related EEG During and After Virtual Tool-use Training

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We examined whether resting-state and task-related EEG power over centro-parietal and frontal brain regions were changed by virtual tool-use training and whether such changes were associated with learning, sense of agency and ownership. Thirty-four young adult participants learned to use a virtual tool for grasping an object in augmented reality. Training was organized in 4 blocks of 60 trials each. Vibrotactile feedback was applied to thumb and index fingers through a CyberTouch II when the tool touched the object. Resting state EEG was collected at pre-test, between training blocks, and at post-test, and resting state power spectra between and after learning were compared with baseline. EEG was collected during all training blocks and analyzed as task-related (de)synchronization relative to the resting period preceding the respective training block. We expected increased resting state beta power over central electrodes to be associated with faster tool-use acquisition and embodiment (Özdenizci, et al, 2017). However, no change in resting state power was revealed in our data. For task-related (de)synchronization we expected enhanced alpha suppression and gamma synchronization over fronto-parietal regions associated with increased control over the virtual tool. In addition, we explored in how far task-related gamma and alpha synchronization over various brain regions was associated with increasing sense of agency and ownership. These data are currently analysed. Finally, EEG correlates of sense of agency and sense of control in a virtual tool-use training paradigm will be discussed.

Effects of virtual reality training on judging action opportunities – a pilot study

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Judging action opportunities requires an estimation of environmental conditions and our own physical abilities. This essential capability can be affected in older age or after brain damage. It would be desirable to develop training tools. Controlled training settings in the real world unfortunately are elaborate. The use of virtual reality (VR) may offer a feasible alternative for realizing trainings. We investigated whether people judge action opportunities in VR environments in the same way as in real environments and whether real world judgment behavior is trainable by use of VR.

24 participants judged whether or not they could fit their hand into a presented aperture. The aperture width varied in size. Stimuli were presented in real as well as in a virtual environment using oculus rift

goggles. First, the equivalence of the settings was evaluated. Second, possible training effects based on feedback in the VR environment were assessed.

Judgment accuracy appeared equivalent between virtual and real environments. The equivalence of both conditions for signal detection variables such as perceptual sensitivity and judgment tendency appeared uncertain. For judgment accuracy, training effects were demonstrated within the VR condition. On a descriptive level the improvement in judgment accuracy appeared transferable to the real condition, but this training transfer did not yield significant effects in the current study. The used approach seems applicable, however future studies should specify potential conditions that might establish enhanced equivalence for signal detection variables and significant transfer effects from VR into the real world of judging action opportunities.

Keep your eyes on the puck: Context information induces predictive eye movements

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To successfully track the puck when watching an ice hockey game the oculomotor system relies on sensory input that is lagging behind its correct position due to processing delays and motor latencies. To compensate for these delays it is necessary to make predictions about the correct position of the puck, which can get very difficult for complex movements with rapid changes in direction. We investigated whether context information (for example the player movements) could help and is integrated in such predictions by showing participants short clips of ice hockey games while tracking their eyes. Participants either saw the regular clip (context) or a still image of the first frame with a black dot moving along the hand-labeled puck positions (no-context). Cross-correlation analysis demonstrated that the peak correlation between eye and target movement was present with a delay of around 200 ms in the no-context condition, whereas the peak was shifted to almost no delay when context was available. Specifically interesting were passes between players, here we observed that participants used the context information and produced predictive saccades to receiving players 200 ms before the puck arrived. Additionally, also stopping the eye at the target location of the pass was more accurate with context, as participants overshoot the location of the end of the pass in the no-context condition. Overall, the use of predictions concerning future target behavior led to vast improvements of tracking performance. Our results show that the oculomotor system efficiently uses context information to counter internal processing delays.

That's me in the spotlight: Self-relevance modulates attentional breadth

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A core theoretical prediction of models of social-cognitive functioning is that attention is preferentially tuned to self-relevant material. Surprisingly, however, unequivocal evidence in support of this viewpoint is scant. Remedying this situation, we demonstrated that self-relevance modulates the distribution of attentional resources during decision-making. In a flanker task, participants reported if to-be-judged stimuli represented (i.e., Expt. 1) — or were owned by (i.e., Expt. 2) — the self or a friend. A consistent pattern of results was observed. Whereas identification of friend-relevant items was speeded when they were flanked by compatible compared to incompatible stimuli, responses to self-related items were resistant to flanker impediment. These findings underscore the potent influence that self-relevance exerts during stimulus processing.

Follow you or follow me? A novel paradigm to study interindividual response conflicts

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Adaptations to response conflicts have been a hot topic of psychological research for decades. Here, we present a novel paradigm to study response conflicts that arise between two co-actors (interindividual conflicts). Specifically, a participant and a co-actor have to move a target in two steps from the bottom center to the top left or right corner of the computer-screen. In a first (forced choice) training block, the participant first chooses her/his final goal (left vs. right top corner); the co-actor then moves the target halfway towards either corner (congruent or incongruent to that chosen by the participant). Finally, the participant has to move the target to the final position. In the follower condition, the participant always has to follow the goal implied in the co-actor's move; in the decider condition s/he always has to follow her/his own original goal. In the critical second block (free choice), however, the participant is allowed to either follow her/his own or the co-actor's goal. All Experiments show that response conflict (i.e., mismatch between the participant's own and the co-actor's goal) was always higher in the free choice block. Critically, sequential conflict adaptation was primarily found in the follower condition suggesting stronger conflict monitoring in that context. Further variants of the paradigm (online vs. lab, human vs. computer co-actor) will be presented and discussed. In general, the paradigm allows to examine interindividual conflicts in different roles (decider or follower) and settings (lab or online) and may offer new insights into the functionality of conflict adaptation.

Learning When to Monitor: Anticipatory saccade latencies mirror action-specific effect delays after a single (re-)learning instance

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When an action consistently causes the same effect, we form a bi-directional action-effect association. This allows us to select the appropriate action to achieve a desired effect by anticipating it. Importantly, effect anticipation does not only affect action selection but also monitoring processes. That is, we anticipatorily move our eyes towards expected future locations of our actions' effects – we proactively monitor future effects of our actions to later compare expected and actual effect. It has been shown that such anticipatory saccades emerge after few (re-)learning instances for spatial action-effect mappings. Interestingly, humans also form associations between their actions and effect delays. Here, we assessed temporal action-effect delay associations to determine how many (re-)learning instances were necessary for anticipatory saccade latencies to reflect the timing of future effects. Participants were instructed to respond to targets with left/right key presses. Correct left/right responses predictably led to a visual effect after a short/long (200 ms vs. 800 ms) effect delay. The mapping between responses and their respective effect delays changed every 4, 8, or 12 trials (randomly allocated), so that participants could not predict when a switch would occur. From the second trial of a new sequence, participants' anticipatory saccade latencies were significantly shorter for effects with short rather than long effect delays.

As for effect positions, we start proactively monitoring effect delays after a single (re-)learning instance. Temporal effect monitoring preceded observable influences of effect timing on action selection, suggesting that monitoring might modulate the influence of action-effect associations on action selection.

Implicit attitudes towards invisible disability: a comparison of measures

Marine Granjon¹, Odile Rohmer, Maria Popa-Roch

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Eighty percent of people with disability have no apparent manifestation of their disability. However, the shared representation of disability is mainly assimilated to a visible form (e.g., international logo for disability). If qualitative research seems to suggest more prejudice towards invisible disability (Santuzzi et al., 2014), little is known about this concept. The aim of the present research was to study the implicit biases associated with invisible disability, compared to visible disability, combining different behavioral measures. We investigated this objective through two studies: (i) 225 participants performed an evaluative priming task, (ii) 202 participants performed a new validated approach/avoidance task, based on grounded cognition (Rougier et al., 2018). The results indicated a partial confirmation of our predictions, challenging two points. First, the literature on disability in social psychology has mainly focused on a minority of persons as invisible disability triggers more prejudice. Second, an alternative approach to classic dual process models in attitudes is needed. We propose a new approach based on grounded cognition.

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Committing to and Disengaging from Goals: Experimental Investigations of Microprocesses of Developmental Regulation

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Processes of commitment to and disengagement from goals are central aspects of explaining developmental regulation. However, research available to date is limited in its explanatory power by several aspects. First, experimental (as opposed to correlational) work is still the exception; this strongly restricts causal conclusions. Second, longitudinal studies are rare. Moreover, retrospective data on developmental strains in cross-sectional studies may not only be biased in general, but may be influenced by processes of goal regulation themselves. Third, almost all studies follow a moderator approach in that they use interindividual differences in goal regulation (e.g., flexibility of goal adjustment) to differentially predict a relationship between stressors and quality of life. Actual processes of intraindividual goal regulation cannot be investigated in this way. Thus, experimental

studies investigating processes of goal regulation are needed that fulfill several conditions. In particular, they have to experimentally vary goal commitment and goal blockages in order to avoid a possible confounding of retrospective stress assessment or individual goal selection with the regulatory resources under investigation. Moreover, processes of goal regulation must be assessed not only via self-report. If we assume that processes of goal regulation are composed of many regulatory processes at the micro level, then subpersonal processes that are inaccessible to introspection and subsequent self-reporting are plausibly a necessary part of the envisioned explanation. This configuration of requirements characterizes the research program on goal disengagement processes, that will be advanced in this symposium.

Hindsight bias in numerical estimates – a by-product of knowledge updating?

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After having learned a fact or the outcome of an event, people often overestimate what they had known beforehand. According to a prominent account, this hindsight bias is a by-product of adaptive knowledge updating (Hoffrage et al., 2000). This proposal, however, has not been submitted to a rigorous empirical test. We conducted such a test in the context of numerical estimation. Participants (N = 220) provided estimates of country populations, received feedback about the correct answers, were asked to report their initial estimates (hindsight task), and provided new estimates. To index the amount of knowledge updating, we quantified individual seeding effects (Brown & Siegler, 1993)—improvements in accuracy for new estimates due to feedback on previous estimates. If hindsight bias reflects knowledge updating, the strength of seeding effects should be related to the strength of hindsight bias. Further, the magnitude of this relationship might depend on the time available to integrate the feedback with existing knowledge. Participants were randomly assigned to a control group, in which no information about correct responses was provided (n = 78), or to one of two experimental groups with correct responses shown either during (“immediate”, n = 72) or prior to the hindsight task (“delay”, n = 70). Providing correct responses elicited a seeding effect and hindsight bias. The strength of seeding effects was positively related to the strength of hindsight bias with delayed feedback, but unrelated with immediate feedback. This suggests that knowledge updating might underlie hindsight bias only under conditions that promote feedback integration.

The Influence of Learned Versus Instructed Target Features on Attentional Control Settings

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In three experiments, we used attention capture effects (of cues) to investigate the emergence of human’s top-down attentional control settings after learning versus verbally instructing target-defining features during visual search. In Experiment 1, participants’ learning of a target-defining color prompted attentional control settings indistinguishable from those prompted by verbal instructions – as indicated by their effects on attention capture. In Experiment 2, color and orientation both independently defined the target. In line with prior learning experiments, participants reported that they learned and used color to search for the target. Consequently, only color cues matching target search settings captured attention, whereas cues with the same orientation as the target did not. To further investigate the dependence of attentional control settings on learned target features, in Experiment 3, participants had to relearn orientation as the new target-defining feature after they had previously learned to search for a color target. The cues’ attention effect suggested that by informing

participants that color was no longer the target's defining feature, participants almost immediately deactivated their previously effective attentional control setting for target color, even before they learned the new target feature. After learning the new target feature (orientation), only cues matching this search setting captured attention, with no capture by cues of the previous targets' color. These results indicate that attentional control settings react fast and flexibly to learned target features and highly resemble those based on verbal instruction.

Understanding the Cumulative Redundancy Bias: A Special Case of a more General Metacognitive Regulation

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The cumulative redundancy bias (CRB) describes the tendency to, by not accounting for redundancy in cumulative information, favorize an agent who has the lead over a trailing competitor in the majority of observations even though the trailing agent catches up in the end. The present research shows, however, that an opposite bias can emerge which feeds from participants focusing on agents' performance slopes. We propose that the CRB and this performance slope bias (PSB) are special cases of a more general metacognitive regulation of information processing.

We first conducted two independent experiments (N = 158 & N = 286) in which we, in contrast to past research, implemented a high difference between the two competing agents' performance slopes. The CRB did not show. Instead the trailing agent with the stronger performance trend was favorized. We followed up on these results with a third experiment (N = 161) explicitly manipulating the performance slopes of agents and the richness of the information environment. CRB as well as PSB emerged in their relevant conditions (low vs. high slope difference). Both biases were enhanced by a rich (vs. poor) information environment.

The three experiments demonstrate a striking flexibility of the cognitive system of people for processing judgements and forecasts that has to be metacognitively managed. The results emphasize that such metacognitive regulation can explain why people disagree even when presented with the same information. Our findings further raise the question of whether it is always better to provide more information on a topic.

Spatial Uncertainty in Probabilistic Forecasts Lowers Perceived Risk and Likelihood of Precautionary Action

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Extreme weather events with potentially severe impacts can call for action even if forecasted probabilities are low. Yet low probabilities are known to be underestimated and oftentimes do not motivate precautionary action as required.

One solution is to communicate higher probabilities by widening the area a forecast is made for: the larger the forecast area, the higher the probability that the event will occur within the area. Yet at the same time, a larger forecast area implies more uncertainty about where the event could occur. Thus, whereas a wider forecast area (i.e., a lower forecast resolution) may heighten individuals' risk perception through larger probabilities, more spatial uncertainty could reverse this effect.

Here, we investigate the effects of spatial forecast resolution and spatial uncertainty on risk perception and decisions in an online experiment (N = 150). For twelve probabilistic thunderstorm forecasts,

participants (i) entered how likely they believed their location would be hit by a thunderstorm, and (ii) decided whether to host an outdoor event at that location at a risk of a high loss or cancel in advance at a smaller cost (blocks randomized).

We find that a lower forecast resolution significantly reduced how likely participants believed to be hit and how often they chose to cancel. Moreover, the effect on participants' risk perception systematically depended on their interpretation of the forecasted probability.

The results demonstrate the need to further investigate the relationship between forecast resolution, risk perception, and decision making, and its implications for the communication of spatial risks.

The role of flexible attention in the creative process: An event-related potential study

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There has long been considerable interest in the role of attention in the creative process. In the recently developed model of creativity and attention (MOCA) Zabelina (2019) proposed that creativity assessed by divergent thinking tests is associated with flexible attention, an ability to adaptively shift between focused (i.e. task-driven) and broad (i.e. stimulus-driven) attention. The underlying mechanism of attentional flexibility in the creative process, however, remains unclear. One way to study attentional shift is the measurement of the P3a component in the event-related potential derived from the electroencephalogram. The P3a amplitude is related to the amount of attention paid to information outside the focus of attention. The aim of this study is to investigate the relationship between creativity and attentional shift indexed with the P3a amplitude. For the study, participants will complete an auditory three-stimulus oddball task (with standard, target and unexpected distractor tones) and an alternate uses task (AUT). Data are currently collected. We aim to present analyzed data of 80 undergraduate students. Attentional shift will be measured by means of the distractor-related P3a amplitude derived from the oddball task. Creativity will be measured by means of originality scores from the AUT. We expect a positive relationship between P3a amplitude and originality values, indicating higher attentional shift in people with higher creativity. This study would allow a deeper understanding of the underlying mechanisms of attentional flexibility and creativity.

Cognitive load reduces interference by head fakes in basketball

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The head fake in basketball is a deceptive action in sports, where an attacking basketball player gazes in one direction (irrelevant component), but passes the ball to the opposite direction (relevant component). A defending player, who aims to respond to the relevant information displayed by the opponent, faces a situation conceptually similar to well-known interference paradigms (e.g., Stroop task, Eriksen flanker task). Previous research has shown that responses to pass directions are slower and more error prone for head fakes than for direct passes (so called head-fake effect). The head-fake effect depends on participants' ability to focus attention on the relevant stimulus feature. As maintaining this attentional focus conceivably bears on limited capacities, we tested if taxing these capacities by a cognitively demanding concurrent task would change the impact of task-irrelevant information and thus, the size of the head-fake effect. Moreover, we investigated the impact of such a concurrent task on post-conflict control (i.e., the congruency sequence effect). The results show that

a concurrent task reduces the head-fake effect, while post-conflict control was unaffected. We discuss these findings with regard to the relationship of working memory processes and selective attention.

Eye did this! – Sense of Agency for Eye Movements

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The experience to be in control of one's actions and their outcomes is called sense of agency. While numerous studies have researched sense of agency for manual actions, we investigated whether typical findings from the manual domain generalize to the oculomotor domain.

In our study, participants performed free-choice saccades to a stimulus on the screen. The stimulus changed its color after a certain delay and participants' task was to reproduce the delay between saccade landing and color-change. In different conditions, participants were led to believe that they could or could not influence the timing of the color-change. We also included a baseline condition in which participants fixated a stimulus, which changed its color after a certain delay.

We analyzed interval reproductions as a measure of temporal binding, as well as explicit agency ratings. We found higher agency ratings and stronger temporal binding between saccades and color-change when participants believed that they had caused the color-change compared to the condition in which they believed they had no control over the color-change. Surprisingly, temporal binding effects were strongest in the baseline condition, while agency ratings were lowest.

These findings indicate that oculomotor actions may generate a sense of agency comparable to manual actions, but peculiarities of the oculomotor effector system have to be taken into account.

Unrealistic Optimism: Fact or Artifact?

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It appears to be the received opinion that people tend to be overoptimistic about personal risks. This phenomenon, usually referred to as unrealistic optimism, is most commonly assessed at group level as individual likelihoods are typically unknown. Subjects either provide a comparative judgement about their own probability to experience a given event relative to an average person or they judge the absolute likelihood of the average person and of themselves, which yields a difference score. The logic is identical in both approaches: If personal estimates are realistic, comparative judgments as well as difference scores should even out to zero across the whole sample. In hundreds of studies employing this paradigm over four decades, subjects have reliably produced aggregate scores differing from zero and indicating apparent unrealistic optimism. Recently, though, the validity of this method has been called into question: Commonly used truncated rating scales and regressive base-rate estimates – whether implicit or explicit – can produce such data patterns even if subjects have perfect knowledge. Empirical research testing these arguments is still very scarce, though. Here, we present the results of six independent studies: Subjects provided percent estimates either of their own and the average likelihood to experience various negative events or only their own likelihood while being provided with the actual base-rates. Results indicate that average difference scores differed from zero mostly due to an overestimation of base-rates rather than an underestimation of personal likelihood as the provision of actual base-rates all but eliminated unrealistic optimism.

Theta Oscillations index not only Conflict - Attentional Amplification of Target Features in a Flanker Task

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Theory. Selective attention is a key mechanism to monitor conflict-related processing and behaviour, by amplifying task-relevant processing and inhibiting task-irrelevant information. Conflict monitoring and resolution is typically associated with a synchronization in the theta frequency range (4-9 Hz), as indexed by increased midfrontal theta power. We expand previous findings of midfrontal theta synchronization related to conflict processing by considering attentional target amplification to be represented in theta synchronization as well.

Methods. The present EEG study (N = 41) examined EEG oscillatory activities associated with stimulus and response conflict in a lateralized flanker task. Depending on the perceptual (in)congruency and response (in)compatibility of distractor-target associations, resulting stimulus and response conflicts were examined in behavioural and electrophysiological data analyses.

Results. Both response and stimulus conflict emerged in RT analysis. Regarding EEG data, response-locked cluster analysis showed an increase of midfrontal theta synchronization related to response conflict. In addition, stimulus-locked cluster analysis revealed early clusters with increased parietal theta power for non-conflicting compared to conflicting trials, followed by increased synchronization in midfrontal theta power for both stimulus and response conflict.

Discussion. Our results suggest that conflict resolution in the flanker task relies on a combination of target amplification, depicted by parietal theta synchronization, and distractor inhibition, indexed by midfrontal theta synchronization, for both stimulus and response conflict.

Drinking the waters of Lethe

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Forgetting is frequently thought of as an involuntary process. There is, however, evidence that people can purposefully forget information. In the directed forgetting paradigm, subjects are asked to remember some information and forget other information, presumably because this information is irrelevant and will not be tested later. Despite these instructions, memory for all information is later tested. Results typically show that subjects have a more difficult time remembering “to be forgotten” than “to be remembered” information. This is referred to as the directed forgetting effect. Although the original concept of memory suppression was that individuals could forget the information that they chose, all of the research on intentional forgetting has involved procedures whereby the researchers inform the subjects which information they should forget. In this experiment, we determine whether directed forgetting effects are also present when subjects choose which information they would like to forget. We use a variation of the item-method directed forgetting procedure, whereby subjects are usually informed after the presentation of each word on a list whether they should remember or forget the word. In our “free choice” variation, subjects decide on their own after the presentation of each word whether they would like to remember or forget the word. We test whether effects are similar with our “free choice” method to standard directed forgetting effects.

Detecting changes of emotional facial expressions in children and adolescents induced by emotional videos: results on the suitability of the FaceReader facial coding software

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Automatic facial coding promises to measure emotional expressions of participants in an effortless and unobtrusive manner. Several studies found that the results of facial coding algorithms are comparable to classifications of trained human observers or measurements of facial muscle activity (Kulke et al., 2020; Lewinski, den Uyl, et al., 2014; Lewinski, Fransen, et al., 2014; Skiendziel et al., 2019; Terzis et al., 2010). Nevertheless, these studies often analysed videos or pictures of participants deliberately giving prototypical emotional expressions. On the contrary, some studies that used videos of participants reacting naturally to emotional stimuli found that the algorithms cannot reliably indicate specific emotions or subjective emotional assessments (Abdel-Rahman et al., 2020; Danner et al., 2014; Höfling et al., 2020; Suhr, 2017).

We examined if the FaceReader 8 (Noldus, 2020) is able to differentiate facial expressions of children and adolescents (age 7 to 15 years), who either viewed neutral video clips or emotionally intense excerpts from a children's TV series. If so, we expected the FaceReader to detect more happy expressions during joyful videos, and less happy/more negative expressions during videos showing sadness, fear, or anger. Indeed, results (N = 56) show that the scales of happy and angry expressions differed between positive and negative videos in the hypothesized way. Nevertheless, other scales either did not vary with emotional content or tended in an unexpected direction. In conclusion, the FaceReader seems suitable to measure natural emotional expressions in young participants when considering some caveats.

Know the next turn! - The effect of an internal human-machine interface on motion sickness mitigation by using anticipatory ambient light cues in a realistic automated driving setting

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Automated vehicles (AV) are deemed to becoming one new standard of transportation. With the introduction of highly automated vehicles, voices of concern arise that motion sickness (MS) will be an obstacle to the user's acceptance of AVs. MS is a syndrome associated with symptoms like nausea, dizziness and other forms of physical discomfort. AVs are potent at inducing MS as users are not adapted to this novel form of transportation, the passengers are likely to engage in non-driving related tasks and are provided with fewer information about the own vehicle's trajectory. As especially individuals with a high MS susceptibility could be limited in their use of AVs, the demand for a MS mitigation strategy is high. MS as a phenomenon is yet to be fully understood. However, passenger anticipation has been shown to have a modulating effect on symptoms, mitigating MS. To find an effective mitigation strategy, the prototype of a human-machine interface (HMI) presenting anticipatory ambient light cues for the AV's next turn is evaluated in this experimental study. In a realistic driving study with participants in an AV on a test track a MS mitigation effect was found within a highly susceptible subsample through the presentation of anticipatory ambient light cues. Additionally, user experience as well as perceived safety and predictability were increased by the HMI.

Implications for future iterations of the prototype, the potential challenges regarding the inclusivity AVs due to MS and the effect of MS mitigation on the acceptance of AVs are discussed.

Explanation of the Privacy Paradox through Social Norms and Personal Beliefs

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The phenomenon of the privacy paradox states that people are concerned about their data, but do not behave accordingly by avoiding disclosure of personal data, for instance, when using social media. The present study investigates whether the amount and sensitivity of disclosed data can be explained by social norms and/or beliefs of a person. Therefore, a social media app dummy was developed and the amount as well as sensitivity of the information provided was manipulated in a sample profile. The results of the online experiment (N = 42) revealed that the amount and sensitivity of data presented in the sample profile showed no significant effects on the amount or sensitivity of personal data given by the participants. However, there was a tendency for participants who got a sample profile with sensitive information to disclose more sensitive and more data. On the other hand, privacy concerns had a small negative effect on the disclosure behavior concerning personal data. Furthermore, participants differentiated between sensitive or insensitive information when disclosing their data. They disclosed sensitive information significantly less often, no matter what profile they saw. Therefore, the beliefs of a person had a greater impact on the disclosure behavior than social norms. In summary, people behave less paradoxically than assumed within the phenomenon of the privacy paradox.

The effect of target novelty and task-irrelevant novelty on response behaviour

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We investigated whether action-valence biases extend to novel stimuli. Humans are inherently motivated to explore new information for potential rewards. Hence, novelty may be processed similarly to positive valence stimuli, especially in individuals with high novelty-seeking traits. We explored this hypothesis in two experiments. Familiar and novel images were presented together with (square/diamond). In the first experiment, participants (n=47) had to approach or avoid the image depending on the content (indoor/outdoor scene). In the second experiment (n=74), the action was determined by the shape presented on top of the image. The images (exp1) and shapes (exp2) were presented at different stimulus onset asymmetries (SOA; 0, 200, 800ms). Results of both experiments showed longer RTs for avoided and novel images, and images/shapes following shorter SOAs. Although approach responses were quicker, this was not specific to novelty, hence we cannot confirm that action-valence bias extend to novel stimuli. Contrary, we observed an interaction effect between action, stimulus, and SOA, showing increased RTs for approached novel images presented at SOA 200ms. We propose that due to the exploration effect, novel stimuli take longer to process when presented as targets (exp1) as well as when novelty is presented in the background, irrelevant to the task (exp2). Interestingly, the effect of novelty is greatest when presented at 200ms. This coincides with a peak in noradrenergic activity, the catecholamine that has been associated with the detection

of novel information. In a next step, we will explore the effect of inter-individual differences on approach and avoid behaviour.

Pre-saccadic attention resists saccadic gain adaptation

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Saccadic eye movements are preceded by shifts of visual attention to their target locations but the exact nature of the relationship between oculomotor programming and attention is still debated. While it has been proposed that visual attention, as a prerequisite of motor programming, selects the saccade target [Schneider, 1995; Deubel & Schneider, 1996; Hanning et al., 2019], oculomotor preparation, conversely, may drive attentional orienting [Rizzolatti et al., 1987; Craighero et al., 1999]. According to the latter view, a modification of the oculomotor program should elicit a corresponding change of the pre-saccadic attention focus. To test this deduction, we experimentally dissociated the intended goal from the actual saccade endpoint via saccadic gain adaptation [McLaughlin, 1967]. Using a novel discrimination paradigm that allows to assess attentional dynamics across the visual field [Hanning & Deubel, 2018], we tracked the pre-saccadic focus of attention during gradual saccade adaptation. While movement amplitudes were reduced by up to 20% of the original vector, visual sensitivity –taken as proxy of attention– remained unaffected by this motor modification, and highest at the original, intended saccade goal, as compared to the adapted saccade endpoint. Contrary to previous reports [Dore-Mazars & Collins, 2005; Collins & Doré-Mazars, 2006], our results argue against a causal role of motor programming for attentional orienting.

From heart to brain and back: novel findings and methodological challenges in interoception research

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Interoception is defined as the sensing of the internal states of the body. It is a complex psychological construct encompassing body-to-brain communication through distinct channels (e.g. neural, endocrinological and chemical), neural representation and integration of these signals, their impact on affective, cognitive and behavioral processes and the conscious interpretation of those as sensations and affective states. Beyond being crucial for the maintenance of homeostasis, interoception has lately gone through renewed interest for its influence on emotional and cognitive processes, as well as its relevance in psychiatric and developmental disorders. Moreover, a continuing challenge to find objective and reliable measures of interoception is currently observed. In this symposium, we will present and discuss recent findings on the interplay of different psychological and biological variables with interoception, shown through a variety of experimental methods (i.e. behavior, physiology, electroencephalography and neuroimaging). In the first talk, Amanda Marshall will discuss how higher interoceptive abilities measured with the heartbeat detection task are associated with higher amplitudes of the heartbeat-evoked potential and enhanced emotion regulation. Next, Helena Hartmann will detail the effects of reduced pain perception induced by placebo analgesia on interoceptive abilities using the heartbeat counting task. This will be followed by a talk from Daniele Di Lernia about interoception in chronic pain conditions, including implications for assessment and treatment. Then, Federica Riva will give insights into the relationship of aging and loneliness with behavioral and neural correlates of interoception. Bigna Lenggenhager will follow to present findings on the contribution of interoception to the development of the bodily self in infants. Finally, the symposium will conclude with a discussion lead by Sahib Khalsa, a leading figure in the field of

interoception. He will not only compare and integrate all previous presentations, but also give a general outlook on future perspectives and methodological challenges regarding behaviour, physiology and neurobiology in interoception research.

Do I feel my heart beating? The effects of placebo analgesia on interoceptive abilities

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Interoception, the ability to sense internal bodily changes, is influenced by different physiological and psychological factors, including subjective pain perception. Previous studies have already shed light on associations between pain and interoception but results so far are contradicting and especially causal investigations are missing. Here, we focused on exploring the influence of reduced pain perception on interoception. We investigated whether placebo analgesia, i.e. the down-regulation of first-hand pain by means of an inert treatment, affects not only our first-hand perception of pain, but also our general ability to detect bodily signals. In this preregistered study (<https://osf.io/gh4sf>), we induced placebo analgesia in 45 participants (placebo group) by means of oral placebo painkiller administration combined with verbal suggestions and a conditioning procedure, while a separate control group of 45 participants did not undergo this experimental manipulation. Participants then completed the classic heartbeat-counting task. From the task, we calculated each participants' interoceptive accuracy. Furthermore, we assessed interoceptive sensibility via confidence ratings and a self-report questionnaire. The groups did not differ in trait interoceptive sensibility. Moreover, we did not find a modulation by the placebo induction for task-related interoceptive accuracy or sensibility. Our results show that placebo analgesia does not seem to affect the perception of one's own heartbeat. This underlines the conclusion that reduced pain perception does not necessarily transfer to basic interoceptive abilities and may be specific to negative emotional states. The present study sheds light on the generalizability vs. specificity of the effects of placebo analgesia to another vital ability, interoception.

Perceptual function of the pupil: Pupil size induced by ambient brightness affects peripheral detection performance

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The pupil, by controlling the light entering the eye, contributes to shaping the basic visual intake. Regarding the many factors which affect pupil size the question arises how this impacts visual perception. However, there is surprisingly few data on the role of pupil size in visual perception. Small apertures increase the resolution of high spatial frequencies, thus allowing to discriminate fine details. Large apertures, in contrast, provide a better signal-to-noise ratio, because more light can enter the eye. Thus, with larger pupils, the remaining low spatial frequencies should be detected better than with small ones. We manipulated pupil size by varying ambient brightness randomly in each trial (dark, bright) while participants were asked to indicate by keypress whenever they detected a low-contrast stimulus presented at 7.7° of eccentricity in the visual periphery. The stimulus was faded in and out on a grey background, reaching four different contrast levels in one of eight possible positions, arranged concentrically around the fixation cross. In two experiments, results show an increased probability of detecting the stimulus with increased stimulus contrast, as well as with decreased ambient brightness.

In Experiment 2 including eye tracking, pupil size was shown to predict detection performance. Thus, large pupils indeed seem to provide an advantage for peripheral detection of faint stimuli.

Phasic alertness and temporal expectations

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Warning cues which do not provide information about target identity or location can nevertheless improve cognitive and perceptual performance. These facilitation effects are due to cue-induced changes in alertness or in temporal expectations regarding upcoming events. In addition, temporal expectations can be induced in the absence of a cue if events are characterized by regular rhythms or if the likelihood of an event occurring varies predictably over time. This symposium presents five studies revolving around such effects of phasic alertness and temporal expectations. The first talk investigates the interplay of phasic alertness and accessory stimulation. Both processes have been studied extensively, but it is unclear how the two work in concert. Here, it will be shown that alerting turns the otherwise helping accessory stimulus into a saboteur of performance. The following two talks explore the neural underpinnings of phasic alertness across the adult life span. They will compare the underlying intrinsic brain networks and EEG activity between healthy younger and older participants. The fourth talk will explain how fixed rhythmic versus random appearances of targets in a continuous presentation stream influence visual processing and pupil size. The last talk focuses on hazard rates, i.e. the increase in an event's conditional probability over time. This talk will show how, unlike cue-based temporal expectations, the influence of hazard-rate on performance is present within and outside the spatial locus of attention.

Intrinsic brain network correlates of phasic alertness in healthy aging

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Phasic alerting cues temporarily increase the brain's arousal state. In younger and older participants, visual processing speed in a whole report task, estimated based on the theory of visual attention (TVA), is increased in cue compared to no-cue conditions. In younger participants, phasic alerting effects on visual processing speed have been linked to intrinsic functional connectivity (iFC) within the cingulo-opercular network. Robertson (2014) suggested that the connectivity of the right fronto-parietal network is essential for maintaining normal alertness capabilities in aging. Thus, the present study assessed whether older participants' ability to profit from warning cues is related to iFC in the cingulo-opercular and/or right fronto-parietal network. We obtained resting-state functional magnetic resonance imaging (rs-fMRI) data from 31 older participants. By combining an independent component analysis of rs-fMRI time courses and dual regression, we investigated iFC in both networks. A voxel-wise multiple regression in older participants revealed that higher phasic alerting effects on visual processing speed were significantly associated with lower right fronto-parietal network iFC. We then compared healthy older participants to a previously reported sample of healthy younger participants to assess whether behaviour-iFC relationships are age group specific. The comparison revealed that the association between phasic alerting and cingulo-opercular network iFC is significantly lower in older than in younger adults. Additionally, it yielded a stronger association between phasic alerting and right fronto-parietal network iFC in older versus younger participants. The results support a particular role of the right fronto-parietal network in maintaining phasic alerting capabilities in aging.

Hemodynamic responses of the anterior "parahippocampal place area" (PPA) to a Hollywood movie's audio-description

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Neuroimaging studies have parcellated the human brain into distinct functional areas. A region in the human hippocampal cortex termed "parahippocampal place area" (PPA) is classically considered to be a higher visual area as increased hemodynamic activity in the PPA correlates with the perception of pictures of landscapes compared to pictures of faces or objects (e.g. Epstein & Kanwisher, 1998, Nature).

To exploratorily test if verbal spatial information embedded in an exclusively auditory naturalistic stimulus correlates with increased hemodynamic activity in the PPA, we analyzed publicly available BOLD fMRI imaging data of 14 subjects undergoing two different acquisitions (studyforrest.org): A dedicated functional localizer experiment of visual areas (Sengupta, 2016, Scientific Data), and the audio-description of the movie Forrest Gump (Hanke, 2014, Scientific Data).

Speech occurring in the audio-description was transcribed, and nouns embedded in sentences spoken by the audio-description's additional narrator were categorized as verbal clues about the depicted spatial layout (N=230) vs. other topics (e.g. objects, faces, bodies; N=1013). Whole-brain voxel-wise general linear model (GLM) analyses were performed to contrast the average response to events providing a spatial clue with the response to events providing a non-spatial clue.

Results reveal significant ($Z > 3.4$, $p < .05$; cluster-corr.) bilateral clusters in the anterior part of the respective individual PPA localizer results of nine subjects and unilateral clusters in two subjects.

Our results provide further evidence that the PPA can be divided into functional subregions (cf. Baldassano, 2016, NeuroImage) and that its anterior part can be localized using a ecologically more valid auditory naturalistic stimulus.

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To exploratorily test if verbal spatial information embedded in an exclusively auditory naturalistic stimulus correlates with increased hemodynamic activity in the PPA, we analyzed publicly available BOLD fMRI imaging data of 14 subjects undergoing two different acquisitions (studyforrest.org): A dedicated functional localizer experiment of visual areas (Sengupta, 2016, Scientific Data), and the audio-description of the movie Forrest Gump (Hanke, 2014, Scientific Data).

Speech occurring in the audio-description was transcribed, and nouns embedded in sentences spoken by the audio-description's additional narrator were categorized as verbal clues about the depicted spatial layout (N=230) vs. other topics (e.g. objects, faces, bodies; N=1013). Whole-brain voxel-wise

general linear model (GLM) analyses were performed to contrast the average response to events providing a spatial clue with the response to events providing a non-spatial clue.

Results reveal significant ($Z > 3.4$, $p < .05$; cluster-corr.) bilateral clusters in the anterior part of the respective individual PPA localizer results of nine subjects and unilateral clusters in two subjects.

Our results provide further evidence that the PPA can be divided into functional subregions (cf. Baldassano, 2016, NeuroImage) and that its anterior part can be localized using a ecologically more valid auditory naturalistic stimulus.

How do chimpanzees explore their environment prior to a risky decision?

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Risk and uncertainty are central to all adaptive decisions human and nonhuman animals make. One way agents can reduce uncertainty is to explore their environment prior to making a choice. The development of exploration strategies in light of human life history is becoming an increasingly studied field (e.g. Gopnik, 2020). Studying how human and nonhuman animals deal with uncertain environments will help us shed light on the evolutionary roots of exploration and adaptive decision making strategies. In the current project we investigated how chimpanzees—one of humans' closest living relatives—explore and learn about their environment prior to making a decision.

Here, we developed a paradigm which allowed us to study how chimpanzees explore initially unknown payoff distributions before making a final exploitative draw (see Hertwig et al., 2004). More specifically, across two conditions (stable and changing), chimpanzees ($N=15$) could explore a risky (outcome variance) and a safe (no variance) assortment, prior to making a decision. In the stable condition, the safe and risky assortment remained on the same side and the food in the same location across trials. In the changing condition, the side of the safe and risky assortment, as well as the location of the food within the assortments changed.

We investigated (1) whether chimpanzees explore changing environments more than stable environments and (2) which strategies chimpanzees use to explore their environment prior to a risky decision. I will present our new paradigm and discuss the correspondence between exploration and decision patterns.

Revealing the similarities and differences between object representations in humans and DNNs

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Deep convolutional neural networks (DNNs) have repeatedly been shown to exhibit a close correspondence to human brain activity and behavior, making them a popular computational model for object representations in humans. Yet, how can DNNs help us advance our understanding of object representations if we don't understand what is the basis of their representational similarities to humans? Likewise, how can we make DNNs more humanlike if we don't know what makes their representations different? To shed light on the processes that are captured by DNNs and those that are still unique to humans, I will use an approach developed in our group that dissects human behavioral similarity judgments about objects into a small number of interpretable dimensions. Treating a DNN as a human participant allows us to reveal similarly interpretable dimensions, which we can compare directly between artificial and human agents. Finally, by mapping human representational dimensions to DNNs, we can reveal what dimensions are still missing and what types

of DNN architectures support more human-like representations. Together, our work highlights the importance of interpretability in computational models and offers a pathway for understanding and improving the correspondence between representations in humans and DNNs.

How do individuals make transformative decisions across the adult lifespan?

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Throughout their lives, people face transformative decisions—decisions that require leaping into an unknown personal future that one cannot fully experience beforehand (e.g., emigrating or separating from a life-partner). Although such decisions have far-reaching consequences for individuals and societies alike, little is known about their prevalence and the cognitive mechanisms underlying them. Previous work has argued that individuals make transformative decisions by applying a maximization mechanism: mentally simulating "what it would be like" to experience a decision's outcomes and choosing the option that promises the highest expected happiness. In contrast, we have recently suggested that people can make transformative decisions by using simple heuristics (e.g., drawing on proxy experiences or social information) to replace unattainable experience-based knowledge. Yet, empirical evidence disentangling these competing hypotheses is currently lacking. In this study, we explore the prevalence and mechanisms underlying transformative decisions with an online representative sample (N = 1,000). Participants are asked whether and how they made real-life transformative decisions in the last two years. We expect most people to have recently faced or to currently face a transformative decision, thus rendering this class of decisions important as well as not utterly exceptional. We also explore which strategies people use and whether these reflect maximization or simpler heuristic mechanisms. Ultimately, by linking such strategies to choice satisfaction, this research can inform future interventions that help individuals make better transformative decisions.

Modeling the Proportion of Individuals Described by a Theory: About the Relevance of Multivariate Assumptions

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Davis-Stober and Regenwetter (2019; D&R) showed that even if all predictions of a theory hold in separate experiments, not even a single individual may be described by all predictions jointly. To illustrate this 'paradox' of converging evidence, D&R derived upper and lower bounds on the proportion of individuals for whom all predictions of a theory hold. These bounds reflect extreme positive and negative stochastic dependence of individual differences across predictions. However, psychological theories often make more specific and plausible assumptions, such as that true individual differences are independent or show a certain degree of consistency (e.g., due to a common underlying trait). Based on this psychometric perspective, I extend D&R's conceptual framework by developing a multivariate normal model of individual effects. The model mitigates the 'paradox' of converging evidence even though it does not resolve it. Overall, scholars can improve the scope of their theories by assuming that individual effects are highly correlated across predictions.

Does it jump or not: Can semantic knowledge influence correspondence processes?

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The visual system is able to represent objects across time because it establishes correspondence between stimuli that are represented as the same at different points in space and time. This correspondence process has been shown to be dependent on spatio-temporal continuity as well as surface-feature similarity. But it is less clear whether higher-level semantic information can influence this process. We conducted two experiments using the Ternus display, an ambiguous apparent motion display. In this display two elements can be perceived as one element jumping across the other (element motion) or as two elements moving together as a group (group motion). Which percept is seen depends on how correspondence has been resolved. In two experiments we manipulated the semantic content of the Ternus elements by using line drawings of different animals as Ternus elements that were either associated with jumping (grasshopper) or not (snail). The animals could either be oriented forwards such that the potential movement direction of the animal was compatible with the Ternus motion, or they could be facing backwards. If semantic knowledge can influence object correspondence, we expected to find more element motion percepts for the animal associated with jumping when it was facing the motion direction compared to when it was oriented backwards. In contrast, for the animal not associated with jumping we expected no effect of the animal orientation. We did not find an effect of the animal orientation for any of the animals, suggesting that semantic knowledge does not influence object correspondence.

Utilizing ACT-R to investigate interactions between working memory and visuospatial attention while driving

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In recent years, adaptive automation systems have emerged as a promising technology to improve the overall safety in everyday traffic. Researchers have been envisioning a system that dynamically adapts to the driver's momentary cognitive state based on the mental workload of drivers. A key step towards this approach is the accurate prediction of cognitive workload while driving. Previous research found interactions between working memory load levels and visuospatial demands complicating the accurate prediction of momentary workload levels. To investigate this interaction further the cognitive concepts working memory load and visuospatial attention were integrated into a cognitive driving model using the cognitive architecture ACT-R. The model was developed to perform a modified n-back task using speed signs while maintaining a safe position on the road. Furthermore, it is able to safely overtake cars in everyday traffic on a multilane highway while continuously adjusting the speed of the car according to the n-back task. The behavioral results show a negative effect on driving performance with increasing task difficulty of the secondary task. Additionally, the model indicates an interaction at a common, task-unspecific level. This is the first step to a fully integrated driving model, which could provide further insight into the interaction between working memory load and visuospatial demand.

Easy online experimentation with lab.js

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Browser-based research enables flexible, location-independent data collection, with access to larger, more representative samples. With lab.js, a free and open-source experiment builder, stimuli can be designed and combined into studies using a graphical interface, without writing code. Experiments constructed with lab.js can be run both online and in-laboratory, hosted via multiple public data collection services as well as on researchers' own web servers. Through empirical validation studies, we show that lab.js keeps and measures presentation and response times with high accuracy and precision across platforms. The software is also built to facilitate open, cumulative science: Studies can be shared in an editable format, archived, adapted and re-used, enabling effortless, transparent replications. The software is provided free of charge under an open-source license; further information, extensive documentation and teaching materials are available from <https://lab.js.org>.

Precise movements in awkward postures: Precision requirements determine grasps for object manipulations

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When people grasp to-be-manipulated objects, they typically select grasps that result in comfortable arm postures at the end of the object manipulation (end-state comfort effect). It has been suggested that comfortable end-states are preferred because they enable the most precise movements. We directly tested this hypothesis by manipulating whether comfortable or uncomfortable arm postures maximized control over an object using a virtual reality object manipulation task. In two experiments, participants predominantly selected grasps that maximized control over the object in the final phase of an object manipulation even when this implied adopting excursed, uncomfortable end-states. In a third experiment, we show that comfortable end-states allowed participants to exert a higher level of control than uncomfortable end-states and that this benefit might suffice to elicit the end-state comfort effect. In summary, these findings directly support the hypothesis that the end-state comfort emerges because it maximizes the control over the manipulated object at the end of object manipulations.

Effects of the metamemory expectancy illusion on study choices and source memory

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Schematic expectations affect source memory and metamemory. When asked to predict their own source memory, people predict better source memory for items that originated from expected sources (e.g., shampoo in the bathroom) than for items from unexpected sources (e.g., microwave in the bathroom; Schaper, Kuhlmann, & Bayen, 2019). This is referred to as the expectancy effect on metamemory. However, actual source memory is often better for unexpected sources (inconsistency effect; Kuhlmann & Bayen, 2016). Thus, the expectancy effect on metamemory is illusory. The authors tested the hypothesis that such metamemory monitoring of source memory affects metamemory control (i.e., measures participants take to achieve a desired level of memory) and memory. Due to the illusory expectancy effect, people should choose to re-study unexpected source–item pairs more often. Three participant groups (n = 36 each) studied expected and unexpected source–item pairs. One

group made metamemory predictions and re-study choices. A second group made re-study choices only. These two groups later re-studied the chosen pairs. A third group did not choose source-item pairs for re-study and instead re-studied a random half of the pairs. Finally, all participants completed a source-monitoring test. As predicted, participants chose to re-study unexpected pairs more often based on their illusory conviction that they would remember unexpected sources more poorly. These re-study choices resulted in an inconsistency effect on source memory not shown in the group without re-study choices. Thus, the metamemory illusion affected control and memory in source monitoring.

Studying Pain-Related Fear in Virtual Reality: Differential Acquisition and Extinction of Affective, Behavioral and Biological Components

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Pain-related fear is critically involved in the development and maintenance of chronic pain. Recent empirical research suggests a key role of learning mechanisms, and experimental paradigms were developed to investigate movement-pain associations and resulting pain-related fear within controlled laboratory settings. However, such paradigms mostly have limited ecological validity. Therefore, this study introduces a new experimental paradigm combining continuous heat-pain stimuli with large arm movements in a naturalistic virtual scenery. Self-reported pain-related fear, pain expectancy, avoidance behavior and electrodermal reactions were assessed in 42 healthy subjects during a) an acquisition phase (contingent movements-pain association) and b) an extinction phase (no movement-pain association). Pain-related fear and pain expectancy ratings demonstrate a significant interaction between learning trial and phase ($F = 4.508$, $p = .004$; $F = 8.526$, $p < .001$) indicating successive acquisition and extinction of the movement-pain association. Avoidance behavior and skin conductance responses demonstrate no such interaction but a significant main effect of phase ($F = 13.739$, $p < .001$; $F = 12.236$, $p < .001$) suggesting fast acquisition and extinction within the first trials; no effects were observed for skin conductance levels. Our results suggest the involvement of two different learning mechanisms in the acquisition and extinction of pain-related fear: While affective and cognitive fear components (ratings) seem to evolve rather slow and more gradually, avoidance behavior and physiological arousal seem to evolve faster. Our study informs about different mechanisms potentially involved in the development of chronic pain and introduces a new experimental paradigm with potential for clinical applications.

Faster Visual Information Processing in Video Gamers Is Associated With EEG Alpha Amplitude Modulation

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Video gaming, specifically action video gaming, seems to improve a range of cognitive functions. The basis for these improvements may be attentional control in conjunction with reward-related learning to amplify the execution of goal-relevant actions while suppressing goal-irrelevant actions. Given that EEG alpha power reflects inhibitory processing, a core component of attentional control, it might represent the electrophysiological substrate of cognitive improvement in video gaming. The aim of this study was to test whether non-video gamers (NVGs), non-action video gamers (NAVGs) and action video gamers (AVGs) exhibit differences in EEG alpha power, and whether this might account for differences in visual information processing as operationalized by the theory of visual attention (TVA).

Forty male volunteers performed a visual short-term memory paradigm where they memorized shape stimuli depicted on circular stimulus displays at six different exposure durations while their EEGs were recorded. Accuracy data was analyzed using TVA-algorithms. There was a positive correlation between the extent of post-stimulus EEG alpha power attenuation (10–12 Hz) and speed of information processing across all participants. Moreover, both EEG alpha power attenuation and speed of information processing were modulated by an interaction between group affiliation and time on task, indicating that video gamers showed larger EEG alpha power attenuations and faster information processing over time than NVGs – with AVGs displaying the largest increase. An additional regression analysis affirmed this observation. From this we concluded that EEG alpha power might be a promising neural substrate for explaining cognitive improvement in video gaming.

The effects of multitasking requirements on chest compression quality in cardiopulmonary resuscitation

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Sudden cardiac arrest is one of the leading causes of mortality. Cardiopulmonary resuscitation (i.e., CPR) is so far the only lifesaving intervention for sudden cardiac arrest. In the present experiment, we investigated the effect of ventilations on chest-compression quality (i.e., depth, rate, and hand position) in CPR. To this end, participants were instructed to resuscitate a collapsed person represented by a manikin (Resusci AnneTM, Laerdal), by performing standard CPR (i.e., chest compressions and ventilation) and chest-compression-only CPR (i.e., chest compressions only). We expected overall chest-compression performance (i.e., performance across all chest compressions) to be worse in standard CPR than in chest-compression-only CPR (i.e., general multitasking costs due to the requirement to maintain and update multiple task sets in working memory). Furthermore, we predicted worse chest-compression performance after than before ventilation (i.e., switch costs due to the requirement to switch between task sets). In contrast to our hypotheses, we observed a better overall compression depth and rate in standard CPR than in chest-compression-only CPR. However, ventilations impaired the rate of the compressions administered immediately after ventilation and tended to reduce the overall number of compressions with an adequate hand position. These findings suggest that ventilations act as a temporal break, improving physical capability which, in turn, enhances chest-compressions because rescuers may have more force to conduct compressions. At the same time, ventilations, however, increase the cognitive demands, thereby reducing chest-compression quality. Thus, the effects of ventilations on chest-compression quality seem to rely on motor-related and cognitive mechanisms.

An experimental validation of the Extended Crosswise Model

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The Crosswise Model (Yu, Tian & Tang, 2008) is an indirect questioning technique designed to control for socially desirable responding in surveys on sensitive topics. The Crosswise Model provides demonstrably more valid prevalence estimates of sensitive attributes than conventional direct questions (Hoffmann, Diedenhofen, Verschuere, & Musch, 2015) and results in higher levels of trust and understanding among participants than other indirect questioning techniques (Hoffmann, Waubert de Puiseau, Schmidt, & Musch, 2017). As a recent advancement, the Extended Crosswise Model (ECWM; Heck, Hoffmann, & Moshagen, 2017) has been proposed. This model allows detecting several forms of response bias without loss in statistical efficiency. In a first practical application of the

ECWM, we assessed the prevalence of islamophobia among a sample of German university students. To this end, 1361 students filled in a one-page questionnaire in either a direct questioning or the ECWM format. As expected, the ECWM provided a higher prevalence estimate of islamophobia than a direct question, indicating that the model successfully controlled for socially desirable responding. An assessment of the ECWM model fit revealed that there was no specific response bias in favor of one of the two answering options, lending further support to the validity of the prevalence estimate obtained. Our results underline the importance of controlling for socially desirable responding, and make the ECWM appear as a promising candidate for future surveys on sensitive topics.

Looking at HMI Concepts for Autonomous Vehicles: System Transparency effects Trust, Gaze Behavior and HMI Preferences of Vehicle Occupants

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Autonomous vehicles promise numerous benefits (e.g., safety, comfort). However, to ensure their usage and reduce distrust and safety concerns of potential users, such vehicles should be transparent and provide intuitively understandable information.

We examined the effects of system transparency (ST) on passengers' perception of driving automation (trust, gaze behavior) and evaluation of human machine interface (HMI) concepts (user experience) during system experience in a driving simulator study. 50 participants experienced three randomized drives, identical in length, driving scenarios and maneuver execution, but presented with HMIs with varying ST: no HMI (just conventional speedometer; low ST), a permanent HMI (high ST) displaying system status, speed and situation representations with vehicle maneuvers during the entire drive, an adaptive HMI (medium ST) continuously displaying system status and speed, but situation representations and maneuvers only within complex situations (i.e., intersections).

With increasing ST, procentual gaze durations (eye tracking) decreased significantly towards the street and increased significantly towards the HMIs. The number of fixation transitions between street and HMI, and trust ratings (questionnaires) rose with increasing ST. Yet, the increase was only significant from low to medium and low to high ST. Interestingly, the increases from medium to high ST were not proportional to the HMIs display times of the entire information content. Additionally, user experience evaluations of the HMIs (questionnaires) expressed preferences for the adaptive HMI. The findings underline the usefulness of ST to increase trust. However, higher ST did not create benefits over medium ST, supporting the usage of more economical, adaptive HMIs.

Prospective Memory in Younger and Older Adults: A Motivational Perspective

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The frequency with which gains and losses occur in different life domains changes systematically across adulthood. Lifespan research has shown that motivational orientation changes accordingly: The pursuit of gains and growth is often predominant in younger adulthood, whereas maintenance of resources and avoidance of losses become increasingly relevant in old age. Such motivational changes can also significantly influence cognitive functioning (including memory performance). In this presentation, age-related differences in prospective remembering are discussed from a motivation-cognition perspective. The memory performance of older adults could be influenced more strongly by the negative consequences of memory failure (and thus by avoidance goals) than by the positive

consequences of successful remembering (i.e., approach goals). We investigated this proposition in a series of experiments with younger, middle-aged, and older adults. Our findings suggest that adult age differences in prospective memory depend on whether negative or positive consequences are emphasized.

Designing Ride Access Points for Shared Automated Vehicles

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Future mobility solutions based on digital technologies, like automated mobility on-demand (AMoD) services, also emphasize the need for supporting digital urban infrastructure. By aiming to reduce users' uncertainty and increasing both user experience and acceptance the need for the new concept of virtual ride access points (VRAP) derives. By enhancing the user's competence and information supply the physical meeting problem of user and shared automated vehicle could be overcome. The objective of this study is to evaluate a first human-centered VRAP design prototype regarding overall usability. Moderated remote user tests were conducted with a sample of early adopters of ride-sharing services. Participants were asked to imagine themselves into a situation of using an AMoD service and were introduced to the early stage prototype. After completion of a standardized usability questionnaire (UEQ), the results show that the presented concept gives a positive initial impression to the participants. The design concept already enhances the user's competence in the given scenario and the prototypes' potential is revealed by high pragmatic quality. Hence, the new concept of a VRAP has the capability to improve human-machine interaction of AMoD services and promotes overcoming the meeting problem. Prospectively, VRAPs could be put into practice with means of augmented reality. With this research the authors seek to conceive human-centered design guidelines for future digital AMoD infrastructure that reduces users' subjective uncertainty and improves both user experience and user acceptance.

Perception of shape changes across saccadic eye movements

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Visual processing in the central and peripheral visual field is vastly different. To achieve a homogeneous representation of the visual world across eye movements, the visual system needs to compensate for these differences. By introducing subtle changes between peripheral and central inputs across saccades, one can test this compensation. We morphed shapes between a triangle and a circle and presented two different change directions (circularity-decrease or -increase) at varying magnitudes across a saccade. In a two-alternative forced choice change-discrimination task, observers over-proportionally often reported percepts of circularity-increase. To test the relationship with visual-field differences, we measured perception when shapes were exclusively presented either in the peripheral (before a saccade), or in the central visual field (after a saccade). We found that overall shapes were perceived as more circular in the peripheral compared to the central visual field and the more pronounced this difference was for a participant, the smaller was their bias in the change-discrimination task. We propose that visual field differences have a direct and an indirect influence on transsaccadic perception of shape changes. The direct influence is based on the mis-calibrated appearance of shape in a given trial; if a shape appears more circular before than after the saccade, shape changes with circularity-increase should have a smaller perceptual magnitude and be overlooked more easily than changes with circularity-decrease. The indirect influence is based on long-

term build-up of transsaccadic expectations; if a change is opposite (circularity-increase) to the expectation (circularity-decrease), it should elicit a strong signal facilitating change detection.

The Impact of Theory of Mind and Media Sign Literacy on Children's Development of Emotional Inferences

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Even young children can draw emotional inferences while watching films. In the present study, we examined the effect of theory of mind and media sign literacy on this ability. Children aged 4 and 5 (N = 65) watched 20 scenes from the television show *Lassie*. The participants' ability to understand the protagonist's emotional states was assessed by an online measure of emotional inferences. The participants' media sign literacy and theory of mind abilities were evaluated as further variables. Their understanding of the scenes was used as a control variable. The results show that while media sign literacy does not have a direct impact on children's ability to draw emotional inferences, it does influence how well they understand the film clips. Understanding the film scenes proves to be an important factor in drawing emotional inferences: Only children who understand the films relatively well build emotional inferences. This effect is moderated by age. Concerning theory of mind, the results show that this ability is meaningful for understanding emotions in films at the age of 4. Children in this age group were only able to generate emotional inferences if they achieved a high score on the theory of mind tasks.

Association between fall and autonomy of older adults with moderation of self-efficacy and cognitive function

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Falling has a prevalence between 30% and 50% in older adults and can have various physical and psychological consequences, such as a fear of falling again, difficulties in walking, decreased functional capacity, dependency and needing help in performing the daily activities, lower self-efficacy, anxiety and depression. We examined the association between falling and autonomy of older adults and whether self-efficacy and cognitive function moderate this relationship. A secondary data analysis was done with existing panel data from the German Ageing Survey ("Deutscher Alterssurvey," DEAS, year 2017, n= 6626). The DEAS study is a longitudinal cohort- based survey of individuals living in private households aged 40 and over (individuals in the second half of life) in Germany. Data analysis was done with SPSS v.27. The moderation analysis was performed using a SPSS PROCESS version v3.5 Macro by Hayes (2013). Number of falls in past 12 months was negatively related to perceived autonomy ($r = -.14$, $p < .001$) and cognitive functioning as measured with the digit symbol test ($r = -.10$, $p < .001$). Linear regressions revealed that experiencing a fall was associated with lower perceived autonomy ($\beta = -.08$, $p < .001$) and lower cognitive function ($\beta = -.06$, $p < .001$). General self-efficacy moderated this association between falls and perceived autonomy ($\beta = .08$, $p = .02$) but not cognitive functioning ($p = .25$). With higher self-efficacy, the association between falls and autonomy was less substantial independent of cognitive functional level.

Beyond Hedonics: The Multiple Functions of fluency

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Fluency, the subjectively experienced ease of information processing, is a concept omnipresent in cognitive and social psychology. It is triggered by many different variables of everyday life, such as repetition, visual contrast, or typicality. It affects many different judgments such as judgments of truth or liking. What is still a matter of debate is how exactly this broad concept of fluency contributes to these different effects associated with it. In this symposium, we will relate the different theoretical perspectives of fluency to each other and look at them in the context of current experimental research.

First, the explanatory power of fluency is demonstrated by Zhang, Newman, and Schwarz, at the example of the truthiness effect - statements are more likely to be judged true when presented with a related nonprobative photo. Next, the hedonic fluency model, the fluency amplification model, and the ecological model are introduced by Unkelbach, Corneille, and Mierop to explain the context-dependency of truth effects. Linked to these models, Silva and Unkelbach offer pseudocontingencies as one explanation for the learned association of fluency and evaluation within contexts. Vogel, Ingendahl, and Winkielman discuss these models in the context of recent findings on the prototype preference effect. Last, Landwehr, Graf, and Eckmann provide further tests for the hedonic and the amplification model and introduce the Pleasure-Interest Model of Aesthetic Liking as an alternative. Finally, Vogel will discuss these different theoretical perspectives and relate the findings to each other.

Financial incentives facilitate the neural computation of prosocial decisions stronger in low empathic individuals

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Financial incentives are commonly used to motivate behaviors, but there is also evidence that incentive can decline the behavior they are supposed to foster, for example documented by a decrease in blood donations if a financial incentive is offered. Based on these findings, previous studies assumed that prosocial motivation is shaped by incentives. However, so far, there is no direct evidence showing an interaction between financial incentives and a specific prosocial motive. Combining drift-diffusion modeling and fMRI, we investigated the effect of financial incentives on empathy, i.e., one of the key motives driving prosocial decisions. In the empathy-alone condition, participants made prosocial decisions based on empathy, in the empathy-bonus condition, they were offered a bonus for prosocial decisions, in addition to empathy induction. On average, the bonus enhanced the information accumulation in empathy-based decision. On the neural level, this enhancement was related to the anterior insula, the same region that also correlated with empathy ratings. Moreover, the effect of the financial incentive on anterior insula activation was stronger the lower a person scored on empathy. These findings show that financial incentives enhance prosocial motivation in the absence of empathy, but have little effect on high empathic individuals.

Judgment or Recall: On the Problematic Procedure for Estimating Parameters of Exemplar Models in Experiments of Quantitative Judgment

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Exemplar models are often used in research on multiple-cue judgments to describe the underlying process of participant's responses. In these experiments, participants are repeatedly presented with the same exemplars (e.g., poisonous bugs) and instructed to memorize these exemplars and their corresponding criterion values (e.g., the toxicity of a bug). We propose that by using this experimental paradigm the judgments of participants in a multiple-cue judgment experiment are a mixture of two qualitatively distinct cognitive processes: judgment and recall. When participants are presented with one of the trained exemplars in some later block of the experiment, they either have learned the exemplar and its respective criterion value and are thus able to recall the exact value, or they have not learned it and thus have to judge its criterion value, as if it was a new stimulus. However, the analysis procedure and the models usually applied do not differentiate between these processes and the data generated by them. We therefore investigated the effect of disregarding the distinction between these two processes on the parameter recovery and the model fit of one exemplar model. The results of a computer simulation and the reanalysis of five experiments show that the current combination of experimental design and modelling procedure can lead to extremely bias in parameter estimates and thus impaired validity of these parameters, as well as negatively affect the fit and predictive performance of the model. As a remedy, we present a latent-mixture extension of the original model which solves these issues.

Simon Zooms? Evidence from high definition transcranial direct current (HD-tDCS) stimulation about attentional versus referential coding

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The Simon effect describes the response time difference between situations in which spatial stimulus codes and response codes overlap and situations in which they differ. Two accounts were proposed, explaining how spatial codes are formed. The attentional coding account (Stoffer, 1991) suggested that an attentional movement from the formerly attended location to the stimulus location causes the formation of spatial codes. In contrast, the referential coding account (Hommel, 1993) states that spatial codes of stimuli are formed in reference to other objects in the visual field, independently of additional attentional movements. The present study had two aims: i) comparing both accounts within a single study and ii) assessing the importance of attentional processes in the Simon effect by applying HD-tDCS to brain areas known to be involved in attention processes during the Simon task. Twenty-three healthy participants performed two Simon tasks in four sessions. The tasks were based on the experimental setup by Stoffer (1991) and Hommel (1993), respectively. After the baseline session without HD-tDCS, in three further sessions, anodal, cathodal and sham stimulation measurements were collected. Significant Simon effects were observed for both Simon tasks under all stimulation conditions. These results are in line with those obtained by Hommel (1993), but contradict the ones obtained by Stoffer (1991). However, cathodal HD-tDCS influenced solely the Simon effects in the Simon task proposed by Stoffer (1991). In summary, the results suggest that both attentional processes and referential coding work together in forming the spatial stimulus code.

Tool-use Training in Augmented Reality: Effects on tactile localization of tactile stimuli on the fingers and associated cortical processing as revealed with EEG

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We investigated whether virtual tool-use training combined with vibro-tactile feedback on the thumb and index finger changes localization of tactile stimuli on those fingers as well as associated cortical processing. Thirty young adult participants learned controlling a virtual gripper in augmented reality to grasp virtual objects at various locations in a horizontal plane. Vibrotactile feedback was applied to those fingers through a CyberTouch II when the tool touched the object. Participants performed 4 blocks of training with 60 trials each. A tactile localization test (TLT) was applied to thumb and index finger at pre-test, mid-test and at post-test. The TLT consisted of 200 stimuli divided into 4 blocks. During TLT, stimulation amplitude was reduced on wrong trials and increased on correct trials. Herewith, mean amplitude served as performance measure as well as mean RT.

Separate GLMs for percent changes in amplitude and RT with pre-test values as covariates and session (mid-test, post-test) as repeated measures revealed significant training effects for amplitude ($F(7,4886)=66.758$, $p<.001$, $p\eta^2=0.074$) and for RT ($F(7,4886)=12.812$, $p<.001$, $p\eta^2=0.018$). Posthoc t-tests revealed that pre-test values for both amplitudes and reaction times were significantly higher in pre- as compared to mid- and post-test (all: $p < 0.05$). Analysis of event related potentials (ERP) during the TLT revealed no session effects on early (N100) sensory components over primary somatosensory cortex but greater longer latency activation (P300) over left frontal regions. This study confirms that virtual tool use training leads to changes in higher order somatosensory processing related to enhanced tactile localization performance.

Influences of inhibitory TMS over visual area V5 on visual speech recognition

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The middle temporal visual area (V5) has been found to play a critical role in visual motion perception in several studies using transcranial magnetic stimulation (TMS; e.g., Laycock et al., 2007, Beckers & Zeki, 1995). Besides this role in low-level motion perception, fMRI findings have revealed area V5 to be involved in the perception of the rather complex biological motion that characterizes visual speech (Borowiak et al., 2018). However, whether there is a causal influence of V5 on speech recognition remains unclear. To investigate the contribution of V5 on visual speech recognition (lip-reading), neuronavigated TMS was applied to area V5 in 28 participants. In separate sessions, each participant received effective and sham stimulation with an offline continuous theta burst protocol over bilateral V5 coordinates that were previously acquired with an fMRI localizer. Subsequently, a visual speech recognition task and person recognition (control) task were administered. We expected that effective TMS would increase response times in the speech recognition task compared to sham stimulation while having no substantial effect on response times in the person recognition task relative to sham stimulation. Contrary to our hypotheses, the bilateral theta burst stimulation did not significantly influence performance in either task. There are two main interpretations for this finding: while area V5 may not critically contribute to visual speech recognition, it also remains possible that other forms of inhibitory neurostimulation on complex motion stimuli may be more effective on a behavioural level.

How the cognitive and motor domains interact: the nature of cognitive processes involved in the control of body balance

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The case for an involvement of supraspinal, high-level cognitive processes in the control of body balance during standing or walking is well established. A multitude of cognitive-motor dual-task paradigms have demonstrated mutual interference effects in either or both functional domains. The patterns of dual-task interactions between balance control and cognitive tasks, however, are rather complex, influenced by task prioritizations, types of the cognitive demands, amount of cognitive load or the postural task, context and balance instructions. Progress from a theoretical point of view has been rather slow mainly considering accounts of interference in terms of the sharing of limited attentional resources. More detailed theoretical accounts are clearly warranted and should be achievable. For example, body balance control seems to occur intermittently and to depend on central anticipatory mechanisms, while cognitive inhibitory processes seem to play a role in intersensory conflict resolution and sensory reweighting. In this symposium we will adopt a more fine-grained view on the mechanisms of processes interference between the balance and cognitive domains. The talks in the symposium will cover the influence of managing cognitive conflict on balance control and vice versa in diverse postural contexts, shed light on the role of working memory processes on balance control and discuss the interdependence between balance control parameters and cognitive processes as it is affected by aging and training.

The influence of cognitive conflict on postural control

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Process interference or sharing of attentional resources between cognitive tasks and control of body balance during upright standing has been well documented. Attentional costs increase with greater balancing demands of a postural activity, for example in standing compared to sitting (Lajoie et al., 1993). In the traditional approach, however, control of body sway is integrated across relative long trial periods of up to several minutes, which blends both postural adjustments and cognitive operations that occurred within the integration period. In the present study, we aimed to assess if single cognitive operations resolving response selection conflict in the Simon task interfere with concurrent control of body sway. In addition to the traditional outcome measures of the Simon task (response latency, error proportions), we investigated the effect of the spatial congruency while pursuing an event-related approach. We expected that conflict resolution in incongruent trials would alter short-term progression of sway control. Our results demonstrated the expected congruency effect on performance in the bimanual response task. We also observed that variability of body sway control within 150 ms before the onset of the manual response was altered by congruency of the response target with reduced variability in incongruent trials with incongruent targets. Assuming that response conflict in incongruent conditions requires inhibition of the incorrect response tendencies, our results imply that mechanisms of cognitive conflict resolution may also play a role in intermittent control of body sway.

Gewöhnen wir uns an fahrerlose Pkw? Untersuchung der Intention zur Straßenquerung von Fußgänger/-innen im kontrollierten Feld

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Die Einführung von automatisierten Pkw in das Straßenverkehrssystem könnte zu (ungewollten) Verhaltensanpassungen bei anderen Verkehrsteilnehmenden führen. Dies kann insbesondere eintreten, wenn automatisierte Pkw als solche gekennzeichnet und wahrgenommen werden sowie ein erweiterter Handlungsspielraum zum individuellen Vorteil genutzt werden kann. Deshalb sollen in diesem Beitrag die Effekte zunehmender Interaktionserfahrung mit gekennzeichneten, fahrerlosen Pkw auf die Intention zur Straßenquerung von Fußgänger/-innen untersucht werden. In einem Quasi-Experiment im kontrollierten Feld mit 7 Versuchspersonen (davon 4 Frauen, Altersdurchschnitt = 30,1 Jahre) und drei Messwiederholungen wurde der Effekt steigender Interaktionserfahrung auf das Sicherheitsgefühl und weitere Determinanten der Intention zur Straßenüberquerung in Abhängigkeit des Fahrzeugtyps (fahrerloser Pkw mit Kennzeichnung, personengesteuerter Pkw) untersucht. Die Messung des Sicherheitsgefühls (als Proxy der am spätesten noch akzeptierten Weglänge) erfolgte im Szenario der Straßenüberquerung ohne Querungsanlage. Zusätzlich interagierten die Versuchspersonen an jedem Versuchstag mit einem fahrerlosen Pkw in vier Szenarien, in denen sie vor oder nach dem Pkw die Straße queren konnten. Das Sicherheitsgefühl stieg unabhängig vom Fahrzeugtyp innerhalb des Versuchstages 1 sowie zwischen den Versuchstagen 1 und 3. Die Einstellung zum Verhalten, soziale Norm, wahrgenommene Verhaltenskontrolle und Risikowahrnehmung bei der Straßenquerung vor einem fahrerlosen Pkw blieben konstant mit steigender Interaktionserfahrung. Post-hoc Interviews zeigten, dass die Versuchspersonen den Fahrzeugtyp nicht in ihrer Entscheidung zur Straßenquerung berücksichtigen. Die Ergebnisse deuten auf eine unveränderte Intention zur Straßenquerung von Fußgänger/-innen vor fahrerlosen Pkw hin. Der beobachtete Anstieg des Sicherheitsgefühls muss vor dem Hintergrund eines Sequenzeffekts (Gewöhnung an den Versuch) kritisch interpretiert werden. In zukünftigen Forschungsarbeiten soll die Qualität des Verhaltens stärker berücksichtigt werden.

Expanding on behavioral data collection in an adapted n-back task for virtual reality

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The n-back task is a typical experimental paradigm for measuring executive working memory (WM) and cognitive load. The task, originally introduced by Kirchner (1958), is a continuous recognition task used to assess working memory updating. Most prior studies use settings where participants react to stimuli on a computer monitor by pressing response keys on a keyboard. In such tasks, 2D stimuli such as digits or letters are typically used, while response accuracy and response times are measured as an indicator for the level of difficulty or the amount of mental effort. In our paradigm, we adapted the task for a virtual reality (VR) setting, where participants have to sort 3D colored balls appearing in 3 to 4 colors. The participants are asked to compare the current ball to the ball presented 1, 2, or 3 trials before. Hand movement trajectories are recorded throughout the trials and are used to expand on reaction times and error rates. Trajectories provide more insight than reaction times into behavioral patterns of the participants, allowing for real-time analysis of behavioral data. The goal of this

approach is to provide a behavioral measure that can combine well with biological data such as electrodermal activity (EDA), electroencephalography (EEG), and Pupillometry.

Is the laboratory a suitable context for investigating free choice? – Comparing and combining different free-/forced-choice paradigms

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What is free choice and how can we investigate it? Being on the philosophical-psychological line of demarcation, these questions have been studied experimentally over the past nearly 65 years. Whereas the early investigations used free-choice conditions mainly as an experimental manipulation for other variables (like response conflict; Berlyne, 1957), later studies also focused on free-choice as an experimental variable itself. The main finding is that free-choice responses take longer than forced-choices even though the origin of this difference is still subject to debate: Is it the freedom of choice or other – experimentally confounded, and therefore non-voluntary – variables that make free-choice responses take longer? Even later, in the task-switching domain, the voluntary task switching variant was introduced to allow for the investigation of “pure” top-down instigation of a task set (Arrington & Logan, 2004, 2005). However, bottom-up effects on voluntary task choice have been demonstrated many times now as well. Bridging those experimental setups and explore whether their respective results are unique or generalizable is the main goal of the current research project. Another main question in focus is whether (and how) one can optimally investigate free choice in the controlled setting of a laboratory. First experimental data of a free/forced task combined with a task switching instruction manipulation will be presented, along with future experimental plans.

I don't wanna call you gay but I think you are! - Investigating the straight response bias by comparing label-based and multisensory approaches based on faces on voices

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Being perceived as lesbian/gay instead of straight can result in homonegative discrimination, ranging from uncomfortable situations to life-threatening events. Both faces and voices communicate information about people's sexual orientation (SO). In previous studies, people tended to judge others as straight more often even when they knew the SO distribution in the target sample. In the present research, we investigated whether social desirability to avoid applying stigmatizing labels to others might explain this straight response bias. Moreover, it is unclear how vocal and facial information is integrated when judging other people's SO. In three experiments, 74 female raters (M = 20 years, 18 – 30 years) judged the SO of 18 lesbian/gay and straight women and men each. First, using an implicit approach, we asked participants to match each target voice to a face belonging to a lesbian/gay vs. straight target (Experiment 1). Next, we explicitly asked participants to rate the targets based on their voices (Experiment 2) and faces (Experiment 3) on a 5-point scale ranging from “lesbian/gay” to “straight”. A signal detection analysis showed that raters judged targets' SO with above-chance accuracy in all three experiments (with higher sensitivities for explicit than implicit approaches). The straight response bias was evident for the explicit but not implicit task. The results suggest social desirability as a mechanism accounting for the straight response bias. They also imply that voices and faces both contribute to SO perception.

Tritone paradox resolved

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Roger Shepard started the study of the pitch elicited by octave-complex tones. These tones elicit a clear-cut perception of pitch class while being ambiguous about octave placement. For relative pitch judgments, Shepard found a sigmoid decrease of S2>S1 judgments depending on their clockwise distance. Shepard suggested that the two possible clockwise distances (S1-S2 vs. S2-S1) were compared and the smaller one would determine relative pitch judgment. This model makes no predictions on the position effect, i.e., whether a certain interval is perceived differently depending on the pitch class it is starting from.

Diana Deutsch studied the perception of tritones of octave-complex tones depending on the position of S1. She found distinct undulation patterns that varied from listener to listener and that depended on the pitch range of speech heard early in life. She conjectured that the mental map of the pitches could be compared to a clockface oriented differently between listeners, with one of the pitches being in the 12 o'clock position. While this model might explain tritone perception, it fails to explain other distances.

We report data of 130 listeners judging all possible intervals of octave-complex tones. We find both the sigmoid decay of S2>S1 judgments when averaged across positions and the position effect found by Deutsch, for tritones but also for many other intervals. We develop a dynamical model based on an individual "attractor octave" for each listener that will change dynamically to a certain extent in function of the context set by the tone presented previously.

Distinct neural and cognitive processes for learning of new versus adjustments of existing behavioural routines

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We need to be able to learn new behaviour, but also be capable of changing existing routines, when they start conflicting with our long-term goals. Little is known about to what extent blank-slate learning of new and adjustment of existing behavioural routines rely on different cognitive and neural mechanisms. We conducted an EEG study and developed a formal cognitive process model for a task where participants first had to acquire novel stimulus-response contingencies, which were subsequently randomly changed to create the need for flexible adjustments. Midfrontal oscillatory power was measured as an indicator of neural conflict processing. Incorrect compared to correct trials led to significantly higher midfrontal theta power during both initial blank-slate learning and subsequent learning adjustments. Importantly, error-related changes in midfrontal theta activity were more pronounced for adjustments compared to blank-slate learning. These findings indicate that the cognitive operations involved in adjusting existing associations compared to blank-slate learning significantly increase the demand for neural processing resources. The computational model of our experimental paradigm was based on a recent adaption of the ACT-R framework. In contrast to previous models of reinforcement learning, this novel approach estimates changes in participants' sense of control over the outcomes of their actions. We discuss in how far modelling subjective sense of control during learning processes can improve the computational simulation of flexible behavioural adjustments in humans. Overall, our results shed new light on the role of neural and cognitive mechanisms for the learning of novel information and subsequent behavioural change.

Can checklists enhance diagnostic reasoning and accuracy?

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Checklists are widely used in various high-risk settings such as the operating room or cockpit. Whether checklists may also improve medical diagnosis in the emergency room, where many diagnostic errors occur, was investigated in this high-fidelity experiment. Advanced medical students (N = 90) were randomized to one of three conditions to work on six clinical cases in a simulated emergency department setting. Group 1 participants received a process-focused checklist, i.e., the instruction to write down all diagnoses they considered on the basis of their first impression of the patient and while acquiring diagnostic test results. Group 2 received a differential diagnosis checklist (DDXC), i.e., a list of 17 differential diagnoses for the chief complaint of the patient. For half of the cases, the DDXC contained the correct diagnosis and for the other half, not (counterbalanced). Group 3 (control) was only instructed to indicate their final diagnosis. Mixed models were used to test the effect of condition and case difficulty on diagnostic reasoning process, accuracy, and case evaluation.

We found that only providing students with a DDXC that contained the correct diagnosis increased the likelihood they would consider the correct diagnosis and diagnostic accuracy compared to the other conditions, across difficulty levels. Extent and quality of data-gathering behavior were not affected by using checklists. Thus, although (differential diagnosis) checklists may enhance diagnostic decisions, their specific content and design are detrimental, which limits their general benefit and applicability for the diagnostic process in high-risk settings such as the emergency room.

Comparing the power of learning via observations versus learning via instructions about observations

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A person's response to a stimulus can be influenced by observing how another person (a "model") interacts with it. In four experiments, we investigated whether simply reading instructions about a model's interaction with a stimulus (i.e., instructions about observations) would change people's evaluations or fear responses to the same extent as actually observing the interaction.

In Experiments 1 (n = 268) and 2 (n = 260), participants either watched videos of a model reacting positively to one stimulus and negatively to another, or read a description of these videos. They then reported their evaluations of both stimuli and completed a personalized Implicit Association Test. In Experiments 3 (n = 60) and 4 (n = 190), participants either observed, or read about, a model who was exposed to an unpleasant sound after the presentation of one stimulus but not after another stimulus. They then encountered these stimuli themselves and reported whether they felt anxious or expected an unpleasant sound to occur. In Experiment 3, skin conductance responses were also recorded.

Results consistently revealed that instructions about the model's interactions with stimuli led to behavioral changes. Depending on specific study parameters, these changes were either smaller, similar, or larger than those resulting from actual observations. We discuss whether learning via observations and via instructions about observations may be mediated by the same processes, whether they differ in their suitability for conveying certain types of information, and whether their varying impact on behavior might depend on context and the information to be transmitted.

Trend evaluation in climate change data – Numerous advantages of line graphs over numbers

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While research and communication on climate change are heavily relying on presenting data in form of line graphs, research is needed to test whether withholding the specific numbers and presenting the evidence graphically might come at the cost of lower acceptance or confidence. We compared how accurately, quickly, and confidently participants could identify trends in climate data presented as graphs vs. as tables. The results suggest that the choice of format does not involve a trade-off. According to the effect sizes, the advantage of graphs over tables was largest in terms of speed but also pronounced in confidence.

TVA parameters in survivors of severe sepsis and effects of computerized training

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Cognitive dysfunction is a major and debilitating problem in sepsis-survivors. Patients suffer from significant cognitive problems especially in the domains of attention and executive functions. So far, effective and feasible training strategies to improve cognitive deficits in those patients have not yet been evaluated. We tested whether these defects can be influenced by specific home-based neuropsychological training. Patients from the Mid-German Sepsis Cohort who are screened with mild cognitive impairment (MCI) but no manifest dementia syndrome according to a clinically established cognitive screening (NAB) were included for a proof-of-principle computerized home-based training that has been shown to be effective in enhancing cognitive functions in elderly participants. Patients were randomized to either a specific attention and executive function training or to a control training with the same duration (3 months) and intensity (3 times 30 min. per week), but with only minimal attention and executive requirements. Training was online-supervised by a psychologist. In pre- and posttests we evaluated the training effectiveness on TVA-based attentional parameters.

Modal and amodal representations: An integrated perspective

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In this presentation, we outline the conceptual dimensions useful for distinguishing between modal and amodal representations. These dimensions suggest that modal representations resemble the entity that they represent (e.g., mental images), whereas amodal representations typically abstract from the detailed aspects of the specific state of affairs that is being represented (e.g., propositions). In addition, the two representational formats probably should not be taken to constitute a dichotomy in a strict sense but rather a kind of continuum ranging from very concrete modality-specific representations on the one hand, to more abstract symbolic representations on the other hand. We argue that both of these two types of representations play a role in various psychological research domains. Illustrative examples are provided from perception, action, and thinking.

Not more accurate, but emotionally biased: Differences in the response bias to emotional and neutral content in the context of historical victimization and perpetration

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Previous research indicates that episodes associated with historical victimization of one's own group are perceived as more memorable than episodes of collective perpetration (e.g. Mazziotta et al., 2014). However, based on the signal detection theory (Stanislaw & Todorov, 1999), Dougal and Rotello (2007) found that the subjective feeling of "remembering certain contents better" in a recognition tasks can be traced back to differences in the response bias, but not to differences in memory performance (sensitivity). Based on these results, the present recognition study (N = 539) examined in context of German National Socialism whether previously presented text passages on German victimhood, German perpetration, or Korean victimhood differ in terms of recognition performance (sensitivity) and response bias for emotional and neutral distractors. While sensitivity did not differ between the three experimental groups, the bias value for neutral distractors was significantly higher for German victimhood (i.e., enhanced tendency to correctly state that the distractors did not occur in the original text) than for German perpetration and Korean victimhood. In contrast, the bias value for emotional distractors was significantly lower for German victimhood (i.e., reduced tendency to correctly state that the distractors did not appear in the original text) than for German perpetration and Korean victimhood. In other words, information about the historical victimhood of one's own national group was remembered in a more emotionally biased way than information about historical perpetration of the group or the victimhood of another group. Implications for the salience of collective victimhood and perpetration are discussed.

The structure and malleability of impulsivity

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Despite its importance in personality, psychopathology, and daily behaviour, impulsivity represents an ill-defined umbrella term. Recent large-scale studies have shown that both different personality traits and different experimental tasks of impulsivity are only very weakly associated with each other, thereby questioning impulsivity as a construct.

Therefore, in order to stress the importance of differentiation between "impulsivity" constructs, in this presentation I will first present a network approach to impulsive personality and behaviour, based on data from both a self-report impulsivity questionnaire and an intertemporal choice task in a large sample (N = 1000). Findings confirm a high degree of heterogeneity between most, though not all, of the constructs commonly referred to as impulsivity. Subsequently, I will focus on an impulsive decision-making task, i.e. intertemporal choice, in order to determine the malleability of this exemplary impulsive behaviour. In a series of studies, it is shown using simple experimental modifications that intertemporal choice is subject to framing effects. I will conclude by integrating these findings with a brief discussion of reproducibility issues in the field of impulsivity research.

Altogether, the presentation will emphasize the importance of taking different perspectives towards the topic of "impulsivity" and raise awareness of framing effects in intertemporal choice tasks.

Cognitive load increases multisensory integration

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Integrating information across different senses is a central feature of human perception. Previous research suggests that multisensory integration is shaped by a context-dependent and largely adaptive interplay between stimulus-driven bottom-up and top-down endogenous influences. However, there is currently little consensus whether multisensory integration is an automatic process, and whether increased multisensory integration is beneficial. One critical question in this debate concerns the extent to which multisensory integration is sensitive to the amount of available cognitive resources.

We assessed multisensory integration using the sound-induced flash illusion (SIFI), in which two auditory beeps presented simultaneously with one visual flash can induce the illusion of two flashes. We used an orthogonal n-back task to deplete available cognitive resources. Our aim was to examine the influence of reduced cognitive resources on the SIFI, and examine the neural mechanisms underlying this influence.

In the first experiment, we found that increased cognitive load induced by the n-back task enhances the susceptibility to the SIFI. In the second experiment we replicated this effect while recording EEG. The analysis of neural oscillations indicated that the interaction between cognitive load and perception is reflected in frontal theta and beta band power. Taken together, our experiments suggest that separating simultaneous auditory and visual stimulation is an effortful process, which falters under cognitive load, resulting in increased audiovisual illusions. We discuss this finding in the context of recent reports on age-related changes in multisensory integration.

Perceiving the height of one's vantage point based on audio-visual cues

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Although applications from fear-of-heights treatments to video games already represent the height of the viewer's vantage point in various ways, the perceptual cues to the observer's elevation in virtual environments have rarely been studied systematically. In the present investigation, an online experiment was conducted in which both visual and auditory cues to the height of the observer's vantage point were independently varied at three levels each, thereby constituting $n=9$ different audiovisual stimulus combinations. The visual cues were screenshots from a virtual environment in first-person perspective, creating the impression of looking out from a high-rise building, randomly either gazing down, straight ahead or upwards. The auditory cues were generated by mixing recordings of traffic and wind noise in proportions plausible to represent the soundscape at the three elevations. Ninety-one participants were recruited, each judging all $n*(n-1)/2 = 36$ pairs of audiovisual stimulus combinations as to which member of the pair represented the higher vantage point. The individual data sets were checked for transitivity violations. Eight participants were found to reach or exceed the 21 transitivity violations to be expected by random responding, and were excluded from further analysis. The data of the remaining 83 participants (19m, 64f) were found to be consistent with the Bradley-Terry-Luce (BTL) model. The estimated scale values show that participants clearly discriminated between the three levels of elevation cues and that both visual and auditory cues influenced their judgment of perceived height in an additive fashion.

Vagally Mediated role in Personality Disorders

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personality disorders (PD) is the most common psychiatric disorder in clinical settings. It is characterized by negative affectivity, emotional lability, anxiety, depression, as well as poor function, all of which have been linked to the autonomic nervous system (ANS), that may be indexed by vagally mediated heart rate variability (vmHRV). It is essential to understand how patients with PDs react to stress and negative emotions in a laboratory-controlled environment. Here, we aimed to quantify the current evidence on alterations of vmHRV in individuals with PDs during the elicited emotion period in order to find novel ANS based treatment for their long-lasting mental and behavioral problems. This study conducted on 74 individuals with PDs that were previously assessed by SWAP-200 PD clinical interview. Two significant components of vmHRV – High-Frequency HRV (HF-HRV) and Respiratory Sinus Arrhythmia (RSA)- were measured during restfulness, in response to elicited emotions and follow-up with HRV-Biofeedback. Findings revealed lower RSA ($P < 0.05$) and Higher HF-HRV ($P < 0.05$) during the emotion exposure period in cluster B and C PDs, but no changes in cluster A. We address the potential underlying biological mechanisms for emotion dysregulation in cluster B and C PDs. So, treatment based on vmHRV would be recommended for these groups, and more investigation for cluster A PDs should be considered in future research.

Enhancing sensitivity for causal structures: Implications for complex problem solving

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The ability to perceive the causal structure of problem situations across multiple contexts is associated with expertise, whereas novices are more likely to concentrate on more salient superficial characteristics. Goldwater and Gentner (2015) showed that an intervention combining explication of causal models and structural alignment of two situations from disparate fields with the same underlying causal model significantly increased the sensitivity for causal structures. Going beyond this finding, we extended this intervention with inference questions and combined it with a subsequent complex problem solving (CPS) task, to investigate whether an enhanced sensitivity for causal structures would result in better performance in CPS. In this study ($N = 108$) we used the MicroDYN framework (Greiff, Wüstenberg, & Funke, 2012) as a measure for CPS. MicroDYN allows the extraction of different CPS performance indicators (knowledge acquisition, knowledge application, strategy). Comparison of CPS performance indicators among three experimental groups (intervention, intervention extended with inference questions, control group) revealed the following results: 1) the effectiveness of the intervention in increasing the sensitivity for causal structures was replicated, 2) the association between the strength of sensitivity for causal structures and performance indicators in MicroDYN was confirmed, and 3) comparison between experimental groups did not reveal differences in performance in CPS. However, those subjects whose sensitivity was increased by the intervention (i.e., intervention responders) did perform better than the control group for the indicators knowledge acquisition and strategy, but not for the indicator knowledge application.

Selective attention to stimulus representations in perception and memory

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Until now, it remains unclear whether attentional selection in perception and memory share a common cognitive and neural basis, only differing in whether the stimulus representation is external or internal, or whether each domain has unique selection processes. So far, evidence for a correspondence of attentional selection remains inconclusive, which might be due to a considerable divergence in tasks and cognitive demands across selection domains. Here, we compared behavioral costs or benefits during attentional selection in perception and memory within-subjects, using the same materials and task, in three experiments. Participants had to selectively respond to one stimulus from a predefined set of potentially response-relevant stimuli. From trial to trial, we systematically varied whether the set or only the to-be-selected target was repeated or changed. Importantly, not only the stimuli and responses themselves, but also their specific stimulus-response bindings were matched, as recent work suggests that they might be the basis for subsequent priming (theory of event coding). While we found identity priming in both selection domains, positive priming in perception was mainly due to repetitions of the target feature (here: color), whereas priming in memory was mainly due to repetitions of the set of stimulus representations. We propose that these differences can be attributed to reduced cognitive effort when the now relevant memory representation had already been preactivated (even as a distractor) in the previous trial. We conclude that any attempt to compare internal vs. external attentional selection must consider those inherent differences in selection dynamics across representational domains.

Interoception: an inside view of physiology, behavior, and neurobiology

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During this discussion I evaluate and integrate the findings from the presentations in this symposium, and will provide an updated outlook on the promises and challenges involved in deriving a multi-level understanding of interoception. The emphasis will be on basic processes with illustration of clinical features when relevant.

Assessing subjective prime awareness on a trial-by-trial basis interferes with masked semantic priming effects

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Priming in a lexical decision task elicited by briefly presented masked words is frequently considered as an index of unconscious automatic semantic processing. In order to confirm that the masked prime is unconsciously processed, an explicit psychophysical prime identification test is typically administered after the priming experiment. Recently, it has been criticized that this classical sequential approach to assess prime identification after the main experiment does not capture trial-wise fluctuations of prime awareness within the priming phase. Based on this criticism, a trial-by-trial prime awareness rating using the Perceptual Awareness Scale (Ramsøy & Overgaard, 2004) within the priming experiment has been introduced. However, it is possible that ratings of the perceptual experience related to the masked prime interferes with concurrent semantic prime processing. The present study therefore compared masked semantic priming effects assessed within the classical sequential procedure, in which prime identification is assessed after the priming experiment, with

those obtained in a condition, in which prime awareness is rated trial-wise within the priming experiment. Analysis of mean reaction times as well as drift diffusion modelling showed that priming effects were significantly smaller in the condition with trial-wise awareness ratings compared to the condition without such ratings. This shows that assessing subjective perceptual experience on a trial-by-trial basis is not a neutral tool to assess fluctuations of prime awareness. Instead, the rating procedure heavily interferes with semantic processes underlying masked priming, presumably due to attentional demands associated with concurrent prime identification.

Probing auditory sensory attenuation in an online experiment using Lab.js and Jatos

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Sensory attenuation refers to the well-established finding that the intensity of sensation caused by self-generated movement is reduced. One common observation is that another person's hand can tickle us, yet we are unable to tickle ourselves.

The predictive coding framework and the active inference theory suggest that the brain weakens the succeeding sensory input of self-initiated actions. In our online study, we examined the relationship between sensory attenuation and sense of agency in the auditory domain. Participants had to compare the volume of two identical tones in a forced choice task. The experiment was divided into two blocks, each including 30 trials. During the active block, participants were instructed to press a button to initiate the first tone. The time interval between the button press and the audio signal randomly varied between 0 - 1000 ms. During the passive block, the tones were presented automatically. In addition to the forced choice task, participants also rated their sense of agency with respect to the presentation of the first tone on a visual analogue scale. In a preliminary data analysis, we found a negative correlation between the length of the action-tone interval and the participants' sense of agency, and an influence on the magnitude of sensory attenuation as well. Due to the coronavirus pandemic our experiment was created online using Lab.js and Jatos. We will briefly discuss some pragmatic issues related to online data collection in perception psychology.

Attention goes all-in for food: ERP correlates of an attentional blink elicited by visual food stimuli

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Emotionally arousing pictures in a rapid serial visual presentation (RSVP) task impair the detection and identification of subsequent target stimuli for several hundred milliseconds. This phenomenon is known as the emotional attentional blink (EAB). In previous behavioural studies, similar effects have been reported for visual food stimuli, providing evidence for a prioritised allocation of attentional resources to food stimuli. This is especially interesting as an attentional bias for visual food stimuli is discussed as a contributing factor to overeating and weight gain. To contribute to a deeper understanding of the attentional processes involved, in the present study we investigated the neuronal mechanisms of the EAB elicited by visual food stimuli. In a RSVP paradigm, event-related potentials (ERPs) in response to task irrelevant food (and non-food) distractors and non-food targets were examined. Enhanced attention for food as compared to non-food distractors should be mirrored in larger amplitudes of attention sensitive ERPs in response to food distractors and in smaller amplitudes of subsequent target ERPs. Specifically, food distractors should elicit larger N2 (selective attention) and

P300 (working memory consolidation) amplitudes than non-food distractors. Furthermore, targets following food distractors within the time-window of the attentional blink, should elicit smaller P300 amplitudes than targets following non-food distractors. Data analysis is in progress; results will be presented at the conference.

Age-related differences in problem solving and learning via insight

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Several cognitive functions, including problem-solving and episodic long-term memory formation, show a decline with advanced age. Problem-solving via insight represents a special associative form of problem-solving, which has previously been shown to facilitate long-term memory formation. Recent neuroimaging evidence suggests that the encoding network involved in insight-based memory formation is largely hippocampus-independent. This may represent a potential advantage in older adults, as the hippocampus is one of the earliest brain structures to show age-related volume loss and functional impairment. Here, we investigated the potential beneficial effects of learning via insight in healthy older (60-79 years) compared to young adults (19-28 yrs). To this end, we compared later memory performance to verbal riddles encoded incidentally via insight-like induced sudden comprehension in both age groups. We employed a variant of the Compound Remote Associate Task (CRAT) for incidental encoding, during which participants were instructed to judge the solvability of items. In a 24 h delayed memory test, participants attempted to solve previously encountered ("old") and new items and additionally performed an old/new recognition memory test on the items. Older adults solved an equal amount of items correctly compared to young adults, despite responding more slowly. Both age groups reported a similar frequency of Aha! experiences. Memory performance was generally better for the young participants, but the older participants exhibited a stronger beneficial effect of sudden comprehension on old/new recognition memory. Our results thus showing that learning via insight might constitute a promising approach to improve memory function in old age.

Temporal binding as multisensory integration: Manipulating perceptual certainty of actions and their effects

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It has been proposed that multisensory integration may be a suitable framework to explain temporal binding, that is, the finding that causally related events such as an action and its effect are perceived to be shifted towards each other in time. Multisensory integration states that individual sensory signals will affect the perception of the multimodal event they are part of relative to their respective certainty of perception. We test whether this assumption holds true in a temporal binding task by manipulating certainty of actions and effects. Two experiments suggest that a relatively uncertain sensory signal in such action-effect sequences is shifted more towards its counterpart than a relatively certain one. This was especially pronounced for temporal binding of the action towards its effect but could also be shown for effect binding. Other conceptual approaches to temporal binding cannot easily explain these results and the study therefore adds to the growing body of evidence endorsing a multisensory integration account on temporal binding.

Attentional Modulations of Alpha Power Are Sensitive to the Task-relevance of Auditory Spatial Information

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Lateral shifts of auditory spatial attention typically result in a hemispheric lateralization of posterior alpha power. However, the degree of spatial specificity of auditory alpha-band modulations remains elusive. Here, we modulated the perceptual load and spatial demand in a sound localization task. A centrally presented target sound was followed by a sound array containing two or four lateralized stimuli (low vs. high perceptual load). In separate task blocks, participants indicated whether the target sound was presented on the left or right side (low-spatial-demand: two response alternatives) or specified the exact target position (high-spatial-demand: four response alternatives). While mean posterior alpha lateralization magnitude was not significantly modulated by perceptual load or spatial demand, the analysis of onset latencies showed that alpha lateralization emerged the earliest in low-perceptual-load / low-spatial-demand trials and the latest in high-perceptual-load / high-spatial-demand trials. Crucially, a repeated-measures correlation analysis confirmed that participants with earlier alpha lateralization onsets showed faster response times. Furthermore, decoding the exact target location based on the topography of alpha-band power revealed higher decoding accuracy in high-spatial-demand trials compared to low-spatial-demand trials. Taken together, both alpha lateralization onset as well as the amount of spatial information that is reflected in the scalp distribution of alpha power vary depending on the spatial demands of the task.

The impact of pictures on effectiveness information in donation requests

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Previous research has shown that pictures grab attention, an effect that is often used by charities to illustrate the importance of the charitable causes. For example, projects to protect the rain forest may present pictures that show untouched nature (desired state) or dead tree stumps (undesired state). These images are usually combined with information about the effectiveness of a donation. Although research suggests that negative pictures as well as more effective projects increase donations, it is unclear whether these effects are additive or multiplicative. This research project examines the effects of picture valence on information processing of effectiveness indicators and its impact on donation decisions. In Experiment 1, we manipulated picture valence (desired vs. undesired state) and presented the effectiveness information that financial contributions do (vs. do not) help to protect the rain forest. Results demonstrated that the information about the effectiveness of financial contributions influences the motivation to donate only if the picture displayed an undesired state. In Experiment 2, we replicated this effect with actual donations in an additional domain (animal protection) by using numerical information regarding the effectiveness of the charitable organization (i.e., overhead costs). Although results indicate that picture valence does not directly influence the willingness to contribute, donors take the effectiveness information more into account when donation requests depict undesired negative states. Besides having practical implications for donation appeals, this finding suggests that pictures influence the way information is processed in donation decisions by changing motivational states.

Putting grasp stability in conflict with your natural hand pose

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We aim to understand grasp preference when we put natural hand configuration in conflict with grasp stability. Twenty-one participants grasped objects using their right hand's thumb and index finger. We rotated three brass cuboids to be either aligned or unaligned with the individual's natural grasp axis (NGA) to investigate when and how people stray from their natural hand configuration. Grasp stability was manipulated by changing the cuboids' surface properties: (a) all-brass, (b) two opposing sides covered with thin wooden strips and (c) two opposing brass sides smeared with Vaseline with the remaining two sides covered with sand paper. Analyses of the grasps on the all-brass object revealed the effect of object orientation: Participants grasped the NGA aligned cuboids with both, clockwise and counterclockwise grasps, but the cuboids rotated away from the NGA primarily with clockwise grasps. This behavior avoided extreme joint angles at the moment of the grasp. Grasps on the wood and sand paper objects, however, were significantly attracted toward the higher friction sides: People grasped the wooden sides more often than the brass sides and the sand paper sides more often than the Vaseline covered brass. The attraction towards the higher friction surfaces was significantly stronger in the sand paper than wood conditions. Our findings show that participants favor grasps that ensure stability over hand configurations that may minimize energy expenditures. These findings suggest a crucial role of surface material properties in grasping.

The Theory of Abductive Reasoning can be Transferred to Real Life Tasks

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The theory of abductive reasoning (TAR) describes reasoning from observations to underlying explanations with a number of operators the reasoner uses during the process. These operators are for instance collect data, comprehend, or check and work together to build a conclusive situation model. Previous studies found support for all these assumptions of TAR using an artificial task. In an experimental study (N = 23), we aimed to investigate whether there are also indicators for the mechanisms postulated by TAR in a task that is closer to real life reasoning. Therefore, we asked participants to solve 12 jigsaw puzzles whereby the abductive task was the identification of the motive presented on the puzzles. Thereby, the pieces of the puzzles posed as observations and hypotheses to the motive of the puzzle as explanations. As a process tracing measure, we used thinking aloud. Verbal protocols were recorded, transcribed and carefully coded according to the operators and explanation types postulated in TAR. We found evidence that participants use most of the operators with a likeliness that significantly lies above chance level. Results are discussed as they give perspective concerning the transferability of the processes postulated in TAR to everyday life reasoning.

Raus aus dem Labor! Was wir über das Prospektive Gedächtnis im echten Leben wissen

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Research on prospective memory is often motivated by its relevance in everyday life. Frequently recurring everyday situations, such as regularly taking medication or remembering appointments, are indeed typical tasks for prospective memory and, according to common belief, are strongly associated with maintaining independence in old age. It is therefore all the more surprising that there are hardly

any empirical data outside the laboratory on the frequency of prospective memory tasks in everyday life, their experienced meaning, content domains, performance level, possible age effects and mechanisms. The present talk will present data from recent studies in which prospective memory of young and older adults was investigated using different methodological approaches such as diary, ambulatory assessment and electronic sensors. The results show, for example, that prospective memory errors are indeed the most common single category of cognitive everyday errors, that there are important correlations with non-cognitive factors such as sleep quality, and that from the perspective of everyday functioning there seems to be no evidence of a systematic decline in (prospective) memory in old age. The findings are discussed with regard to central models of prospective memory but also with regard to their relevance for cognitive aging research in general.

Testing potentiates new learning across a retention interval and a lag, but only for categorized study material

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The forward testing effect (FTE) refers to the finding that retrieval practice of initially studied material can facilitate learning and memory of newly studied target material. Using categorized item lists as study material, Chan et al. (2018) recently showed that the FTE persists in the presence of a prolonged retention interval between study and test of the (final) target list or a prolonged lag prior to study of the (final) target list. The goal of the present study was to examine whether the magnitude of the FTE following prolonged retention interval or prolonged lag varies with study material. We were able to replicate the finding that the FTE persists across prolonged retention interval and prolonged lag, but only when categorized item lists were used. If, however, unrelated item lists were applied, the FTE largely disappeared after both prolonged retention interval and prolonged lag. These findings on the critical role of study material for the FTE are consistent with a two-factor explanation of the FTE, which assumes contributions of both strategy change and context change for the FTE. The account suggests that the FTE is mainly driven by strategy change with categorized material and is mainly driven by context change with unrelated material.

Do we perceive the world differently if we need to evaluate our percept? – an EEG study

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The information available to our senses is limited, making multiple interpretations possible. The brain decides for the most probable interpretation to provide stable and reliable percepts. Depending on the sensory information's quality, this decision can become difficult. Recent studies indicate the existence of a meta-perceptual evaluation system, rating the reliability of perceptual decisions. In the current study, we investigated whether the necessity to explicitly report reliability of the perceptual decision changes processing of the observed stimulus.

We presented ambiguous and unambiguous lattices in random order. In Condition 1, participants indicated the perceived 3D lattice orientations. In Condition 2, participants additionally reported the confidence of their perceptual decision.

Already 100 ms after lattice onset overall larger ERP amplitudes are found in Condition 1 compared to Condition 2. This amplitude difference is reflected in an occipital component starting at 104 ms (E1), a

frontopolar component at 172 ms (E2), a parietal P300-like signal at 324 ms (E3), and a temporally sustained positivity lasting for more than 400 ms (E4).

The a priori knowledge about a second evaluation task may amplify visual processing units (E1). Perceptual decision and top-down evaluation steps may start immediately after the lattice-gestalt construction (E2). In Condition 2 the evaluation result needs to be kept in working memory until the evaluation response, 1600 ms after stimulus onset (E4). In summary, the necessity to rate our perceptual decisions starts to alter perceptual processing remarkably early. We seem to perceive the world differently if we need to evaluate our percepts.

Are spatial-numerical representations rather cardinal or ordinal? An investigation with the SNARC effect

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Spatial-numerical representations are supposed to be a cornerstone of numerical and arithmetic processes. One of the hallmark effect is the Spatial-numerical association of response codes (SNARC effect). Despite almost 30 years of research, the mechanisms underlying the SNARC effect are still unknown. In particular, there is a debate, whether it relies on rather amodal ordinal sequences in working memory (WM), which are not specific for numbers or on cardinal number magnitude representations (as the mental number line), which is probably bound to modal representations of magnitude. There is some recent evidence suggesting ordinal WM as the underlying representation; however, this evidence was usually collected with a WM task as a secondary task.

Here, we investigate this question without a WM task as a secondary task, by a simple, but careful manipulation of ordinal and magnitude properties of the stimuli. Stimulus sets like 1(1), 2(2), 3(3), and 8(4) were used in a standard SNARC experiment (ordinal positions in brackets). It was examined whether magnitude or ordinal position produced the best fit to the data.

Although the results depended somewhat on the analyses chosen, it seemed that magnitude of the numbers played a more major role in explaining the data. We conclude that a purely amodal ordinal WM account of the SNARC cannot explain the data without additional assumptions.

Organizational hormone effects and reactions to a dominance contest: An experimental approach

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We tested if organizational hormone effects during puberty moderate the effect of winning or losing an experimental dominance contest on affective, hormonal, and learning outcomes in a sample of 90 individuals. We expected effects on all three outcome dimensions based on the idea that organizational hormone effects shape the endocrine system's reaction to dominance-relevant encounters later in life (Manning et al., 2014). Sex-matched dyads of two participants competed against each other in a balancing task on a stability platform and received feedback whether they had won or lost a given trial after 30-seconds-balancing intervals. The feedback, however, was experimentally manipulated, with one participant winning 8 out of 10 trials (win condition) and the other one only 2 (lose condition). Organizational hormone effects of pubertal estradiol and

testosterone were approximated via morphometric markers in facial (facial width-to-height ratio) and body (ulna-to-fibula ratio) dimensions. Affective reactions were assessed with the Self-Assessment Manikin (SAM; Bradley & Lang, 1994) and hormonal reactions via pre- and post-contest saliva samples, respectively. Learning outcome was measured via time-in-balance performance gains from post-competition to a retention test 24 hours later. Results of this research will be presented in the talk (results of saliva assessment only if available until the upload date).

Grams or cubes? Accuracy of sugar content estimation is measure-dependent

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Sugar consumption in the general population exceeds recommendations. To decrease sugar consumption and so reduce health risks, consumers need to be able to accurately estimate the sugar content of foods. The present study compared two commonly used measures to quantify sugar consumption, i.e. grams and sugar cubes, to test which estimation measure leads to higher accuracy.

Sugar content estimations were assessed in 886 participants of the longitudinal cohort study Konstanz Life Study, who were randomly assigned to a sugar estimation task in grams ($n = 453$) or cubes ($n = 433$). Both groups estimated sugar content of 10 common food items.

Estimations of sugar content diverged considerably from actual values in both groups ($t_s \geq 4.02$, $p_s \leq .001$, $d_s \geq 0.20$). However, misestimation was more pronounced when sugar content was estimated in grams compared to sugar cubes in 7 out of 10 foods ($t_s \geq 4.04$, $p_s \leq .001$, $d_s \geq 0.14$). On average, sugar consumption was overestimated by 544% ($SD = 516$) in grams/ by 300% ($SD = 419$) in sugar cubes.

Although overestimation was substantial in both groups, estimation in sugar cubes led to more accurate estimations. This may be due to participants having a more intuitive understanding of amounts of sugar in cubes due to greater familiarity.

Response Activation and Activation-Transmission in Response-Based Backward Crosstalk: Analyses and Simulations with an Extended Diffusion Model

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In dual-task experiments, overlapping response characteristics of two subsequently performed tasks cannot only affect performance in Task 2, but also in Task 1. This interference is often explained by automatically activated Task 2 response information influencing Task 1 processing that then somehow back-propagates into Task 2. So far, however, only little is known about (a) the time-course of this automatic response activation and (b) possible transmission/propagation mechanisms. The present study tried to address both issues by testing ten a-priori plausible drift-diffusion models using five datasets from dual-task experiments. To this end, we first examined if the temporal course of the automatic response activation is linear or pulse-like. The pulse-like model proved to be superior, but the corresponding dynamics of the response activation often described a monotonically increasing function that peaks late during Task 1 processing – mirroring the idea behind a linear model. By extending the pulse-like model with an additional diffusion process, we then examined whether and how the Task 2 automatic response information could affect the subsequent Task 2 central processing. Concerning the transmission mechanisms, none of the models proved to be satisfying at first. However, after running additional simulations, it can be assumed that variants in which a Task 2 activation-transmission does not occur, or in which it partially occurs in every trial, seem implausible. Only those

variants seemed promising in which transmission occurred in compatible trials, but not in incompatible trials, and in which the Task 1 associated response information got reset to a certain percentage.

A Comprehensive and Preregistered Meta-Analysis on the Effects of Experimentally Induced Body Positions: Effects on Self-Perception but not on Physiology

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Research on body positions suggests that engaging in certain nonverbal displays can lead to changes at a psychological, behavioral, and physiological level. Still, there has been intense criticism and discussion regarding the replicability of these effects. To provide evidence on the question which effects are valid, we conducted a comprehensive meta-analysis on the effects of body positions. We use the dominance-prestige framework and distinguish two types of body positions: high vs. low power poses and upright vs. slumped postures. We preregistered our strategy and hypotheses, used the so far largest sample of studies and reported several meta-analytical estimates. Based on 234 effects from 85 studies we found evidence for an overall effect of body positions, $g = .302$ (95% CI [0.206, 0.398]). Both, poses and postures showed effects. Evidence was found for self-reports and behavioral measures but not for physiological variables. Whether the study had used a cover story or not did not make a difference—which suggests that demand characteristics were not the driving factor. Whether a study was preregistered or not did not make a difference either, which suggests that the results do not rely on questionable research practices. An exploratory test on the question which group drives the effect did not provide conclusive evidence. We also present an app that researchers can use to enter data from future studies and thus obtain up-to-date meta-analytical evidence for future reference. Upcoming research should address the question which experimental group drives the effect.

A sequential sampling account of semantic relatedness judgments

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To make inferences about the structure of semantic memory, researchers often rely on subjective judgments of semantic relatedness between concepts. These judgments can be on a rating scale as in Osgood's semantic differential technique, or on a binary Related-Unrelated dimension as in the semantic relatedness judgment task (SRJT). In the SRJT, people judge whether two concepts (e.g., "lion" and "stripes") are related or not. The difference in response times (RTs) between Related and Unrelated judgments is then used to draw conclusions about the processes or the structure of semantic memory. However, researchers have been missing to address the significance of the judgment process which in itself affects choice and RT behavior in the SRJT.

Here, we propose a cognitive process model from the sequential sampling framework, which integrates memory and decision aspects of semantic relatedness judgments, and accounts for choices and RTs. We specified a leaky, competing accumulator model (LCA) which describes the relatedness judgment as a competition between evidence for a Related or Unrelated decision. Evidence for judging the concepts to be related depends on semantic distance between both concepts.

Our model predicts that when semantic distance is short, Related judgments are faster than Unrelated judgments. Vice versa, when semantic distance is large, Unrelated judgments are judged faster than Related judgments. Using a Bayesian random effects model, we tested these predictions on published

data from Kumar et al. (2019). We found credible evidence for our theory-driven predictions, rendering the LCA a viable candidate to describe memory-based decision making.

Influence of affective valence on perceptual filling-in

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Predictive coding models of human cognition conceive perceptual and affective processes to be closely interconnected. It is yet still an open question, whether the link of both processes is limited to the unidirectional influence of perceptual prediction errors on emotion or whether emotional status also can in turn alter low-level perceptual processing. In order to elucidate this question, in this preregistered study 50 participants listened to either harmonic instrumental music or stressful acoustic noise, inducing positive and negative affect. They were then asked to report onset times in a visual illusion task (uniformity illusion). The uniformity illusion consists of a visual pattern in which central and peripheral contents differ from another but where central fixation leads to the extrapolation of foveal contents to extrafoveal areas of the visual field. Preliminary data analysis shows a reduction of the time for this perceptual filling-in to take effect (difference in response times of illusory and control trials) for the positive valence condition. These findings suggest an influential role of emotional states in low-level perceptual processing, furthering our understanding of emotion-perception interactions.

Predictive value of valence-dependent neural correlates of augmented feedback processing for behavioral adaptation and learning in extensive motor learning

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To examine the neural processing of valence-dependent augmented feedback, 38 students learned a sequential arm-movement task with 192 trials in each of five practice sessions. An adaptive bandwidth for movement accuracy led to equal frequencies of positive and negative feedback. Event-related potentials were recorded time-locked to feedback onset in the first and last practice session. Different ERP components were analysed reflecting reinforcement learning (feedback-related negativity; FRN), supervised learning (late fronto-central positivity; LFCP), as well as updating of internal models (P300). Motor automaticity was tested under dual-task-conditions before and after the practice phase. Coherences between neural feedback processing, short-term behavioral adaptations, and different dimensions of long-term learning (i.e., accuracy, consistency, and automaticity) were examined. More negative amplitudes of the peak in the FRN time-window after negative feedback were predictive for goal-independent changes of behavior in the early practice phase, whereas more positive amplitudes of the LFCP after negative feedback were predictive for goal-directed behavioral adjustments (error reduction), in the first as well as in the last practice session. Unexpectedly, more positive P300 amplitudes after positive feedback also predicted goal-directed behavioral adaptations. Concerning long-term learning and motor automatization, a positive correlation was found for the reduction of dual-task costs (i.e., automatization) and LFCP amplitudes after positive feedback in the early practice phase.

Perspective determines how cues are weighted in pointing interpretation

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Pointing gestures are pervasive in daily communication to direct the attention of others. We examined, how the observer perspective affects pointer-observer misunderstanding. We hypothesise that observers extrapolate the pointing arm to derive the target location from sideward positions, while they increasingly rely on the pointing finger in their visual field when leaving the side and moving closer to the pointer. When their visual fields overlap, changes in observer's view height should have a large effect on the interpretation, compared to a negligible one from sideward perspectives. In a virtual reality experiment participants saw a virtual pointer and were asked to estimate the pointed-at position from various observer viewpoints, observer heights and for different gesture directions. In line with our expectations, observers used different strategies depending on their perspective. Small viewpoint modifications influenced the interpretation stronger when standing directly behind the pointer, but only have slight effects at side viewpoints. This interpretation pattern was also found in a second experiment that transferred the critical conditions to reality. In the third experiment, we manipulated the fingertip position independently from the arm direction to test how both cues are weighted in the interpretation for various observer viewpoints. The results confirm our hypothesis that the fingertip position is increasingly affecting the interpretation the more both perspectives overlap while simultaneously, the arm direction is decreasingly affecting the estimation when the viewpoint is shifting from the side of the pointer closer to him.

The effect of self-awareness and problem-solving on the experience of an action crisis

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The occurrence of setbacks and difficulties in goal pursuit can raise serious doubts and a decisional conflict about the further pursuit of a personal goal, that is, a so-called action crisis. We took a differential perspective on the study of an action crisis by examining the role of self-awareness and problem-solving orientation for its experience. In a daily diary study with professional ballet dancers (Study 1) and an ESM study with students (Study 2), we demonstrate that individuals with greater levels of dispositional self-awareness are more problem-solving oriented in dealing with goal-related difficulties, which resulted in a lower experience of an action crisis. In Study 2, we were moreover able to replicate this mediational effect on a daily level and showed its positive effect on (objectively assessed) goal performance (i.e., grades). These findings suggest that increased levels of self-awareness lead to a functional way of dealing with goal-related difficulties and thus helps to prevent the experience of an action crisis.

Hindsight bias in the absence of outcome knowledge?

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Once people have acquired knowledge about a particular numerical fact (e.g., the population size of Spain), they tend to reconstruct their previous (naïve) estimate of that fact with a bias towards the correct answer. According to a prominent account, this hindsight bias is a by-product of adaptive knowledge updating (Hoffrage et al., 2000), where the relevant knowledge base on which judgments feed (e.g., cue knowledge, or metric knowledge about a domain) is updated by providing the correct answer. If so, it should be possible to produce a hindsight bias without providing information about the original facts directly, but by merely providing relevant domain knowledge. To test this hypothesis, we designed an experiment where participants (N = 210) are asked to provide estimates of the population sizes of a set of countries and then receive either information about the actual population sizes of these countries (feedback group), the population of a different but comparable set of countries ("seeding" group), or no feedback (control group). All participants are then asked to recall their initial estimates (hindsight task) and to provide estimates for a new set of countries (transfer-of-knowledge task). The key question is whether, consistent with the knowledge-updating account of hindsight bias, the recalled estimates in the seeding group are shifted towards the true population size, relative to initial estimates. The results speak to the role of learning processes in the emergence of memory distortions and help refine cognitive theories of hindsight bias.

Is revenge sweet? Spontaneous pleasurable responses after revenge taking

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Previous research has sometimes shown people feeling better after revenge taking, sometimes worse. The majority of this research has used self-report measures, allowing for intervening evaluative processes. It is therefore unclear whether revenge-taking causes spontaneous pleasure in the moment. We thus implemented a competitive reaction time task against two opponents (one aggressive, one nonaggressive). Participant responses on an affective misattribution task directly after assigning the opponents punishment were measured. Results indicate that assigning punishment to an aggressive opponent produced more positive misattribution than assigning punishment to a nonaggressive opponent, but only in participants who showed a behavioral tendency towards revenge. Our results suggest that revenge is at least briefly sweet - if one is interested in pursuing it. Potential contributions to our understanding of affective dynamics in revenge-taking are discussed.

An additional experiment is planned in which a comparison to a no-punishment condition is implemented. Furthermore, pilot experiments establishing the paradigm are discussed.

TVA to the rescue? What should a theory of visual attention, visual working memory and foraging contain?

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Theoretical accounts of attention that have been dominant over the last close-to 50 years have trouble explaining recent results from studies on visual foraging tasks, where observers have to select many targets of different types among distractors within a single trial. For example, the results suggest that theories with simple fixed capacity limits may be too restrictive. Participant's strategies may reflect a more complex interaction between capacity and task demands. Secondly, typical response time patterns from visual search tasks, that have been used to inspire prominent theories of visual attention, are only seen for the last target within a foraging trial. These selections are also much slower than the majority of other selections within trials. Thirdly targets that are distinguishable from distractors by a single color should pop out in a feature map, according to standard theories, but clearly they do not. Fourth, selection times are often comparable for feature and conjunction foraging which contradicts standard theories of attention, while patterns of the order of target selection differs strongly between those conditions. I will discuss what sort of additions and modifications should be made to theoretical accounts of attention, and whether current theories should be modified or whether we should even "start from scratch" by building a new theory of visual attention to account for the results. I will also speculate whether the flexibility of the theory of visual attention (TVA) may make it uniquely suited to account for performance patterns in foraging studies.

The influence of mood on old new recognition and source memory for happy and sad faces

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Facial identification is important because it informs us regarding how to react to an approaching person, who might be friend or foe. In social situations, the emotional expressions of faces are important and very salient aspects of nonverbal communication. Previous work has shown that the facial expression (happy or angry) influences the memory of this face in a later recognition test.

It is possible that positive expressions facilitate facial processing, therefore, more cognitive resources are available to process facial identity. Research on mood dependent memory shows that the likelihood of recalling something is higher when encoding and retrieval moods match than when they mismatch. We wanted to examine whether memory for positive and negative faces is influenced by the emotional state of the participant. Results indicate that old-new discrimination but not source memory is affected by whether a face was presented with a positive or a negative expression, independently of the emotional state the person was in.

Exogenous covert attention does not account for the eccentricity effect in duration estimation in an online study

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Previous studies on the influence of eccentricity on perceived duration showed an increasing underestimation of duration with increasing stimulus eccentricity (Kliegl & Huckauf, 2014). This eccentricity effect might be affected by spatial attention. There are already studies showing that precueing the stimulus location leads to prolonged perceived duration (Seifried & Ulrich, 2011), regardless of stimulus eccentricity (Yeshurun & Marom, 2008). In the present study, we investigated the influence of exogenous covert attention on the eccentricity effect in duration estimation in an online experiment. In a duration estimation task based to the one used by Kliegl & Huckauf (2014), participants judged whether a comparison stimulus with varying duration presented in near or far distance to fixation was shorter or longer than a foveally presented standard stimulus with a constant duration. To manipulate exogenous covert attention, a cueing display similar to the one of Seifried & Ulrich (2011) was used. Attention was either directed to the position of the subsequent peripheral comparison stimulus by an exogenous luminance cue (valid cue) or did not convey information regarding the position (neutral cue). The results show a larger underestimation of duration for the far than the near stimulus, thus replicating the eccentricity effect in an online experiment. Although cueing was effective (i.e., response latencies were shorter for valid relative to neutral cues), cueing did not alter the eccentricity effect in duration estimation. This indicates that cueing indeed leads to covert attentional shifts but does not account for the eccentricity effect in perceived duration.

Effects of negation on visual processing capacity and attentional weight differences

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How does negation influence attention? Although rarely asked in research, it stands to reason that instructions using a negation might hamper the distribution of attention. The present work investigates this possibility by combining a cognitive model of visual attention and a simple judgment task. A judgment of the temporal order of two visual events allows access to the overall amount of resources available for visual processing and to their distribution among objects. The results indicate that—depending on the setting—both, the overall available processing resources and the distribution of attention, can be affected. Repeating the same instruction in consecutive trials reduced the difference between instructions with and without negation. We interpret this result with respect to pragmatic frames and discuss the possibility of a deliberate use of negation for the purpose of attentional guidance.

Anodal transcranial direct-current stimulation (tDCS) improves voluntary task scheduling in dual-task situations

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Dual-task (DT) situations require task-order coordination processes that schedule the processing of two temporally overlapping tasks. Evidence for these processes stems from the observation that when participants can freely decide about task order they tend to repeat the task order of the previous trial resulting in fewer order switches compared to order repetitions. This order repetition bias suggests that intentionally switching compared to repeating task order requires additional and intention-based task-order coordination processes. In two experiments, we investigated whether the dorsolateral prefrontal cortex (dLPFC) is causally involved in implementing these intentional scheduling processes by employing transcranial direct-current stimulation (tDCS). We applied a DT consisting of an auditory and a visual 3-choice reaction time task and participants were instructed to freely decide in which order to perform both tasks. Additionally, in a control condition, participants were instructed to perform the two tasks with constant (and not changing) task order. Anodal (Experiment 1) and cathodal (Experiment 2) tDCS was administered over the left dLPFC. Anodal stimulation improved whereas cathodal stimulation impaired DT performance in order-switch trials compared to sham stimulation. Performance in order-repetition trials as well as in the control condition was unaffected by stimulation. In sum, our experiments indicate that the dLPFC is causally involved in intentionally switching task order and, thus, contributes to self-organized task scheduling in multitasking situations.

Distractors attenuate emotion effects on attention during free viewing

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In everyday situations, numerous stimuli compete for attention and which stimulus is attended may depend on various features, including its emotional content. Usually, an attention shift is accompanied by an eye-movement towards the stimulus of interest. However, previous neuroscientific research commonly instructed participants to inhibit natural eye-movements to avoid artefacts in Electroencephalography (EEG) data. The current preregistered (<https://osf.io/324ds>) study aimed to investigate the effects of emotional facial expressions on overt attention shifts, depending on the competition between distractors. Eye-tracking and EEG were coregistered to simultaneously measure natural eye-movements and underlying neural responses. In a fixation-shift-paradigm, participants saw a face in the center of the screen. Once they fixated on it, a second face would appear in the periphery, contingent on the participant's gaze, displaying a happy, angry or neutral expression. This face could either appear while the central face remained visible (competition condition) or while it disappeared (non-competition condition). Participants moved their eyes freely from faces in the center of the screen to faces appearing in the periphery. While eye-movements and early neural responses (P1) were only negligibly affected by emotional expressions, later neural responses (Early Posterior Negativity, EPN) were increased in response to emotional content. Interestingly, the emotional modulation of the EPN was attenuated when the two targets were competing for attention, compared to when only one target was visible. This suggests that distractors, which typically appear in everyday life situations, may reduce the effects of emotional content on attention.

Experimental clinical data – approaches, challenges and solutions

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Experimental data in clinical psychology are hard to achieve given ethical restrictions and the often messy and long-lasting data acquisition. Hence, this symposium covers the field of experimental psychopathology, where clinical processes are artificially provoked and the statistical challenges in analyzing clinical data. Two experimental clinical studies with different approaches are presented. The first study induced shame in an online setting using audio files, and investigated the relationships between trait and state shame. The second study induced dissociative symptoms in a lab setting using audio and video stimuli, investigating neural, parasympathetic and behavioral correlates. In the third talk, the challenges of statistical analysis of clinical data are and the differences between traditional approaches often used in clinical psychology and more modern approaches are demonstrated. Talk 4 presents the use of machine-based learning approaches to experimental clinical data. It is investigated whether a classifier algorithm can successfully distinguish between EG and CG on the basis of the EEG data from Talk 2. The last talk gives an example of a successful experimental clinical study. The first aim of this study was to investigate the efficacy of a CBT programme for anxiety when applied to somatoform vertigo, the second to find out whether there are differences or similarities of neural correlates before and after treatment in and between patient groups, and thirdly to compare findings with a healthy control group (HC).

Talks:

Tim Reichenberger: Experimental Induction of Shame using Audio-Files in an Online Setting

Patricia Kulla: Induction of Dissociative Symptoms in Healthy Participants – Neural and Behavioral Correlates

Dr. Tina Braun: Facing the Challenges of Statistical Analysis of Experimental Psychopathological Data

Hannes Diemerling: Classifier Analysis of EEG Data from an experimental clinical psychology study

Max Maywald: Functional MRI examination and the efficacy of cognitive behavioural group therapy in patients with anxiety disorder and somatoform vertigo.

Induction of Dissociative Symptoms in Healthy Participants – Neural and Behavioral Correlates

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Dissociative symptoms appear in many psychiatric disorders (e.g. PTSD, Borderline, ED, OCD (Lyssenko et al., 2018)) and often have a negative influence on the course of disorder and treatment (Bae et al., 2016; Kleindienst et al., 2016). However, little is known about the psychobiological basics and the effectiveness of treatments of dissociative symptoms (Inelli et al., 2014). We developed an experimental setting in which we presented audio and video stimuli with 12Hz for 6 minutes to healthy participants (EG (n=40); CG: Signals with 1.5Hz (n=20), based on Leonard et al. (1999)) while conduction EEG, SCR and ECG and assessing behavioral data. Results show a significant increase in state dissociation in EG vs. CG from post resting state to post induction ($F(1.26, 33.99)=8.29$, $p=0.004$, $d=0.994$). However, we could not find differences in temporal theta ($F(2,20)=2.06$, $p=0.154$), SCR ($F(1.37, 50.82) = 1.358$, $p = .260$, partial $\eta^2 = .035$) and HRV ($F(2, 97) = .744$, $p = .478$, partial $\eta^2 = .015$) between groups and measurement times. This could be due to the artificial nature of the experiment, but maybe the psychobiological correlates of dissociation remain yet unclear. Further studies should

explore other possible neural regions and signals. However, our setting is a promising approach to study mechanisms of dissociative symptoms in healthy participants.

(How) can we predict relative preferences with eye tracking data?

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In various eye tracking experiments, the applied tasks and their corresponding goals affect participants' gaze behaviour. This is especially relevant when measuring eye movements to assess preferences. Therefore, we aim to understand the effect of differing task goals on distinct eye tracking measures (e.g., total fixation duration, fixation counts, visit duration, dwell time). Furthermore, we investigate the possibility to correctly predict preferences by gaze behaviour (in)dependent of the task goal. We analyse eye tracking measures underlying relative preferences using a within-participants design with 3 task types (no task / most liked / least liked) x 2 stimulus types (faces / objects) – data collection will be completed in February 2021. We hypothesise that eye movements in the “most liked”-condition predict the relative preferences, e.g. the fixation duration is longer for the chosen, and thus preferred, stimuli. In contrast, we do not expect such a predictive effect in the “least liked”-condition.

Boundary Conditions for Hedonic Fluency Effects

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Hedonic fluency effects are ubiquitous and the current literature attests to their robustness and replicability. Nevertheless, over the last couple of years several empirical insights have accumulated that point to contextual factors that diminish, eliminate, or even reverse the hedonic impact of perceived processing fluency. The current talk summarizes some of these findings and discusses two recent theoretical approaches that might help to integrate these findings into an overarching theoretical perspective on fluency effects. In particular, we present and discuss the Pleasure-Interest Model of Aesthetic Liking that adopts a dual process perspective on fluency effects and predicts that some hedonic fluency effects do not occur when information is processed in a controlled (vs. an automatic) processing style. Furthermore, we present evidence for an amplifying effect of processing fluency and discuss this effect against the background of the inherent valence of stimulus material, which implies that hedonic fluency effects are more likely to occur for inherently positive (vs. negative) stimuli.

Perceptual Load and Sex-Specific Personality Traits: The Impact of the Big Five Personality Dimensions on Visual Search

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We tested young adults (N = 65) to investigate whether the Big Five personality traits Extroversion (E), Openness (O), Agreeableness (A), Conscientiousness (C), and Neuroticism (N) and the autism score have an impact on visual search in men and women. In three experiments, we varied stimulus complexity and predictability. As expected, latencies were longer when the target was absent. Pop-out search was faster than conjunction search. A large number of distracters slowed down reaction times. Stimulus complexity as such did not lead to a deterioration in accuracy, but absence of predictability

of stimulus complexity reduced accuracy by about half. Simple stimuli (singletons) encouraged especially men with neurotic or autistic traits to fast reaction times, breaking-off search quicker when no target was present, while they induced conscientious or agreeable women to slow down even if the target was present. When perceptual load was high with complex stimuli, men did not show a significant impact of personality traits on their search, while women, if introverted or with low scores on openness, could slow down even further to reaction times that are more typical for children. We conclude that perceptual load mediates the impact of sex-specific personality traits on speed of visual search.

Beneficial effects of cortisol on cognitive regulation of high intensive emotions independent of timing

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Acute stress leads to the secretion of the stress hormone cortisol and influences how we experience and react to emotional situations. Previous studies provide evidence for a stress-induced improvement of cognitive emotion regulation possibly mediated via cortisol actions. One critical modulating factor appears to be the time between cortisol increases and regulation task. Cortisol can cause immediate and delayed effects on neuronal activation, which may influence cognitive control functioning involved in emotion regulation processes. In this study, we thus sought to characterize time-dependent effects of oral cortisol administration and its interaction with stimulus intensity on cognitive emotion regulation outcomes. Eighty-five healthy men received either cortisol or a placebo 30 or 90min prior to an emotion regulation paradigm, in which they were asked to downregulate their emotional responses towards low and high intensive negative pictures via reappraisal or distraction. Affective ratings and pupil dilation served to measure emotion regulation success as well as the cognitive effort to regulate upcoming emotions. Reduced arousal, enhanced valence ratings as well as pupil dilation enlargements indexing increases in cognitive effort indicated successful downregulation of negative emotions evoked by high intensive but not low intensive negative pictures. Independent of the timing of pharmacological treatment, cortisol administration further improved the effectivity of reappraisal and distraction to downregulate emotional arousal evoked by high intensive negative pictures. Our findings therefore identify cortisol to be a key mediator of beneficial stress effects on the cognitive downregulation of high intensive emotions that might aid the adaptive recovery from acute stress states.

Can monetary reward shorten the bottleneck in dual-tasking?

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In dual-task situations, dual-task costs arise for task 1 and task 2. This is explained by the central bottleneck model with serial processing of the response selection stages of task 1 and task 2. Whereas task 1 performance is relatively unaffected, task 2 performance improves as stimulus-onset-asynchrony (SOA) increases between task 1 and task 2.

The occurrence of dual-task costs is a reliable finding. While many studies asked whether the costs can be reduced for example by training or motivation, we asked whether the application of monetary reward (MR) can change the central bottleneck processing and via this reduce the dual-task costs.

In the current study, participants performed a dual-task and received MR if their mean reaction time to task 2 (RT2) was below a predefined threshold. To infer the locus of the reward effect within the dual-task stream, we used the locus-of-slack technique (LOST).

As a result, MR reduced both, reaction time on task 1 (RT1) and on task 2 (RT2). Furthermore, the RT2 difference between MR and No-MR condition was greater at short SOA compared to long SOA on task 2.

These results indicate that central bottleneck processing was not changed and that participants allocated MR already to task 1. MR influenced task 1 performance and task 2 performance.

The effects on both tasks summarise at short SOA resulting in a greater MR effect at short SOA for RT2 compared to longer SOA. In sum, we found evidence for a general effect of MR on dual-tasking.

Design of External Human-Machine Interfaces for Different Vehicle Types

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Future traffic will be determined by the joint interaction of highly automated vehicles (AV) and other traffic participants, e.g., pedestrians, in mixed traffic environments. To ensure a safe and efficient traffic flow, AVs must be able to communicate with the traffic environment. An external human-machine interface (eHMI) seems to be a promising solution to transmit explicit information to other traffic participants and to enable an adequate communication. However, it remains unclear how information needs differ for different vehicle types and how this must be considered in the eHMI design. Therefore, this experimental online study investigates information needs when interacting with two different AV types (car vs. bus) both equipped with the same eHMI communication strategies (mode awareness, intention-based, perception-based, combination) based on a LED light-band as eHMI. Video sequences were shown in which the participants crossed a shared space from a pedestrian's perspective in front of both vehicle types equipped with the eHMI communication strategies. Results showed that participants felt significantly safer for both vehicle types (car and bus) for all three eHMI explicit communication strategies (intention-based, perception-based, combination) vs. mere mode awareness or no eHMI at all. Comparing both vehicle types (car vs. bus), descriptive statistics indicated that participants felt safer and more comfortable when interacting with a car compared to a bus. This effect was significant for the perceived comfort showing that participants felt more comfortable when interacting with a car compared to a bus both equipped with an eHMI communication strategy combining intention-based and perception-based eHMI.

“Do as I say and you’re a great guy!” Resistance to friendly social influence while feeling socially excluded

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In social interactions, people often face trade-offs concerning their personal autonomy. This becomes most apparent when reacting to ostensibly well-meant social influence: do I resist or do I comply? Perceptions of freedom and the psychology of reactance tap into this decision. We confronted participants with a collaborative task during which their teammate would communicate a friendly and approval-offering but very silly request on how to solve the task. Uncritically following this request would lead to a bad team performance and participants would miss out on extra money. We tested whether resulting reactance displays were associated with an increased (awareness hypothesis) or decreased (burden hypothesis) sense of freedom. Further, we tested if the experience of social

exclusion would make participants more susceptible to our friendly influence attempt. The results of three experiments differed by interaction context.

In a face-to-face lab experiment (N = 94), nearly all participants complied and approved of their teammate, without feeling threatened in their freedom. In two online experiments (N = 320), implementing the same task and request, influenced participants showed significant resistance and a decreased sense of freedom while disapproving of their teammate. Induced feelings of social exclusion exerted no moderating effect on these results. We discuss these findings in regard to the profound difference between study contexts (face-to-face versus online), and their implications for concepts like autonomy, directed influence and rapport-building.

What remains in the eye region for estimating person characteristics?

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Parts of a face convey different information about a person. We infer invariant (sex, age), partly variant (trustworthiness, attractiveness, approachability), and variable (arousal, valence) characteristics from others faces. Sometimes, the face is partially occluded by clothing, such as by face masks in current pandemic times. To investigate how these characteristics are affected by face mask occlusion, we compared characteristics ratings between masked and no-masked faces with different expressions (happy, neutral, sad). We found that most characteristics were affected by face masks. When compared to no-masked faces with the same expressions, masked happy faces looked more aroused and happier, masked neutral faces were less aroused and less happy, and masked sad faces looked less happy. Masked faces appeared older, more male, and less attractive than no-masked versions. Face masks did not influence two characteristics: trustworthiness and approachability. In our post-hoc analysis, we modelled the data to investigate if invariant and variable characteristics predicted partly variant characteristics. Our models indicate that how certain the observer was at judging the sex of a face guided trustworthiness ratings. What remains visible between masked and no-masked faces, i.e. the eye region, elicited invariant characteristics regarding sex. This was used to infer trustworthiness. From this finding, we propose various avenues for future studies to explore the features of eye and gaze which potentially convey trust.

Working memory encoding modulates the attentional blink: An evaluation using lab-based and web-based experiments.

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The attentional blink (AB) is a phenomenon of temporal attention in which a second target (T2) in an RVSP stream is missed if it shortly follows a first target (T1). The exact causes of the AB is still debated although the phenomenon has been discovered some 30 years ago. One prominent theory posits that an initial rapid-detection stage is followed by a second, capacity-limited stage, in which items are encoded for later report. Thus, encoding demands of T1 likely contribute to the AB. Here we show In a series of experiments that the AB is modulated by working memory encoding of T1. When the possible set from which T1 was drawn was small {A, Z}, the AB was diminished compared to a large T1 set {A, B, ..., Z}. When T1 task required categorization of letter color rather than letter identification, the AB was similarly diminished, but not more strongly than with a small identification set. When T2 was defined as the last item of a category in the stream so that the task required continuous working memory updating, the AB was prolonged. Taken together these results indicate a strong contribution

of working memory encoding to the AB. A comparison of lab-based, controlled experiments with browser-based data collected on heterogeneous devices during the COVID-19 pandemic suggests that the AB can be obtained in a heterogeneous environment, but at the cost of a significant loss in precision.

This guy looks dangerous – The influence of ethnicity and individually perceived threat of a face in the identification of a weapon.

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The weapon identification task (WIT) is a priming task introduced by Payne (2001) which aims to measure the influence of the ethnicity of face primes on the identification of innocuous objects vs. weapon stimuli. The general finding of the WIT is, that when participants are primed with black male faces in comparison to white male faces, they are more prone to misidentify an innocuous object as a dangerous weapon. This weapon identification bias is typically attributed to the influence of stereotype associations for black males being seen as more threatening.

In German society the stereotype of North African males being dangerous and violent might be present. This can be observed e.g., in the political discussion about asylum policies in Germany or the discussion about violent assaults at New Year's Eve in Cologne 2015 by allegedly predominant North African males. Beyond ethnicity, variations in the individually perceived threat of a face prime might influence the performance in the WIT. As people are fast to ascribe personal characteristics like trustworthiness to faces.

The talk will present an adaptation of the WIT in Germany. Thereby, face primes will be varied by ethnicity (North African and Middle European) and the ascribed threat to these male faces.

Recent Advances in the Scientific Study of Consciousness

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Crick and Koch (1990) famously incited the scientific community that “the time is now ripe for an attack on the neural basis of consciousness.” In this symposium, we present a collection of recent scientific efforts to fulfill this objective, with methods ranging from fMRI, EEG, eye tracking and pharmacological interventions to virtual reality assessment. In the first talk, Wolfgang Einhäuser-Treyer (Chemnitz) presents recent findings on perceptual multistability by using the optokinetic response, addressing the question whether no-report paradigms allow a valid and potentially superior measurement of visual awareness. Maria Niedernhuber (Cambridge) presents evidence from an EEG study for a role of converged lower-level sensory inputs in the formation of conscious awareness by investigating the P3b component as a marker of higher-order prediction violation. Frederik Bergmann (Cambridge) discusses what happens when unwanted memories intrude conscious awareness in a think/no-think paradigm and outlines the underlying neural correlates. Niclas Braun (Bonn) demonstrates that clinically relevant phenomena regarding bodily self-awareness such as the supernumerary phantom limb illusion or the resized limb illusion can be induced in healthy participants within a virtual reality setting. The neural and pharmacological processes underlying monitoring consciousness will be discussed by Mirko Lehmann (Bonn), who will present evidence from a functional magnetic resonance imaging study for a ketamine-induced impairment of metacognitive sensitivity. In the final segment, Ulrich Ettinger (Bonn) will discuss and expand on the previous presentations and integrate them into a composite picture of current progress in consciousness research. Overall, this symposium will provide listeners

with the opportunity to learn about current research advances on the topic of consciousness and its neural basis across multiple methods.

Challenging metacognition – Neural correlates of ketamine-induced impairment of metacognitive accuracy

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Only little is known about the pharmacological underpinnings of metacognition or »monitoring consciousness«. The double-blind, placebo-controlled fMRI study presented in this talk is the first to investigate the effects of the NDMA glutamate receptor antagonist ketamine on metacognition and the associated neural correlates. 53 participants completed two study phases of an episodic memory task, with trial-by-trial confidence ratings being collected during retrieval. There were significant effects of ketamine on all scales of the 5D-ASC questionnaire, confirming that the drug elicited a psychedelic state. When ketamine was only present at encoding, both behavioral and BOLD measures were found to be unaffected. Acute ketamine administration during retrieval, however, led to larger metacognitive bias (i.e., overconfident responses), with no effects on primary task performance. There was also an indication of a ketamine-associated deterioration of metacognitive sensitivity (i.e., the ability to discriminate between own correct and incorrect responses via confidence ratings), although hierarchical Bayesian analysis yielded no clear evidence for a ketamine effect on performance-corrected sensitivity. Measures of BOLD revealed that ketamine compared to placebo elicited higher activation of cortical brain areas which are of interest with regard to the »posterior hot zone« for conscious functions. Overall, the findings presented in this talk suggest that ketamine impacts metacognition, leading to overconfident and less accurate metacognitive responses. The talk will outline the potential drivers of this effect and conclude that metacognition seems to rely at least partly on the integrity of the glutamatergic system.

Detecting respondent burden through mouse-tracking: Distinguishing sources of item difficulty in online surveys

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Online surveys have become a widely used mode of data collection. However, because there is no interviewer present, respondents face any difficulty alone, which may lead to measurement errors, and biased or (at worst) invalid conclusions. Detecting this difficulty is therefore vital. Previous research has tried to detect response difficulty in general by analyzing the behavior of respondents, and identified promising indicators, predominantly the total response time. However, response difficulty may stem from different sources, such as overly complex wording or similarity between response options. So far, the question whether indicators can discriminate between these sources has not been addressed. The goal of the present study, therefore, was to evaluate to which degree participants' cursor movements reflect specific sources of difficulty in an online survey. Specifically, we hypothesized that different mouse movement patterns are related to specific properties of survey questions that increase response difficulty. In a preregistered online experiment, we manipulated the length of the question text, the complexity of the question wording, and the difficulty of the response options orthogonally between questions. We hypothesized that these changes would lead to increased

response times, hovers (movement pauses) and y-flips (changes in vertical movement direction), respectively. As expected, each manipulation led to an increase in the corresponding measure, although the effects were not limited to that specific measure but affected the other dependent variables as well. However, effects did differ in their strength, indicating that differentiating several sources of response difficulty might indeed be feasible using mouse tracking.

Spatial Working Memory in Virtual Environment Navigation: Scene Recall Depends on Observer Position

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In the imagery of locations, subjects situated in the locations' vicinity tend to picture it from an egocentric perspective. This effect has been clearly demonstrated in real urban environments where pedestrian have been asked to produce a reconstruction of a nearby target area. However, these experiments are compromised by a lack of control over parameters such as familiarity with the environment or immediate experience of the target place, such as a recent visit. Even when testing subjects in VR using replications of familiar locations, the subjects' relation to the real life area may influence their behaviour significantly.

Thus our goal is to test whether subjects behave the same if novel target and testing locations are learned and experienced in virtual reality only.

We used two areas, featuring four buildings from the area surrounding the Taj Mahal (India) or the Angkor Thom temple area (Cambodia), respectively. After a learning phase, subjects were positioned outside a surrounding wall occluding the target area. Global orientation was provided by local and distant landmarks that remained visible at all times. Subjects walked towards the occluded target area and were then presented with different views of the target area in which two of the four buildings had been modified. Subjects were asked to pick the two images most closely resembling the target area, not necessarily the viewing direction.

First results show a significant dependence of image selection on viewing direction. This result confirms earlier results in real environments and generalizes them to newly learned virtual environments.

Persuasive eyes – How negotiation success shapes eye-directed gaze behavior

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The human eyes accomplish a remarkable task most other senses can only look up to: They are able to both perceive and send information to our environment. Observing the way others look enables us to infer about their focus of attention and differences in status and personality. Further, being able to hold eye contact was found to be related to one's perceived persuasiveness. However, it is not clear whether maintained eye-directed gaze behavior is actually used strategically to persuade others. To gain a deeper insight into how we employ our gaze behavior, we designed an experimental negotiation task during which we measured the gaze behavior of 73 participants acting as negotiation leaders using stationary eye tracking technology. We experimentally varied the negotiation outcomes throughout the task to investigate whether participants' gaze behavior adjusts as a reaction to persuasion success or failure. Our results reveal adaptations in eye-directed gaze behavior when the need to be more persuasive arises. These findings advance our understanding of the communicative function of human gaze and provide a foundation for future experimental research on the inter- and intraindividual factors shaping social gaze behavior.

The earlier the better? Effectiveness of frustration mitigation strategies via a speech-based in-car assistant

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Frustration as a negative emotion may negatively affect driving performance in manual driving as well as frustration may impair user experience of human-machine interaction, e.g., in automated driving. While there have been extensive research efforts to assess the user's (negative) affective state in the vehicle, little progress has been made on the mitigation of these affective states. Thus, little is known about interaction strategies for automotive user interfaces that successfully mitigate the user's frustration. Our experimental online study focuses on the appropriate timing for speech-based interventions in two use cases (manual and automated driving). These use cases serve as experimental frustration inducing vignettes for driving scenarios. The theoretical basis for the frustration mitigation strategies is Gross' process model of emotion regulation. Within this context a suitable antecedent-focused emotion regulation strategy, i.e., 'cognitive change' for manual and 'situation modification' for automated driving, have been implemented in form of verbal interventions via a voice-user interface in the car. Participants were randomly assigned to one of the two use cases and to one of three conditions: early (N=290) or late start of mitigation (N=286) or control group without any mitigation (N=288). Both mitigation strategies (early and late) had a strong effect on reducing the frustration level compared to the control group. The early start proved to be more effective with regard to the development and the level of frustration during the whole experiment. Implications for a refined design of such assistants and for further research will be pointed out.

Anticipatory suppression and enhancement of bodily signals when operating body-external tools

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Using tools is sometimes insurmountable to reach certain actions goals. However, tool use often also transforms the body movements required to operate the tool, into movements of some other form. This can lead to considerable conflict between the perceptual (e.g. visual) information from the body-external tool and body-related (e.g., proprioceptive) information. This might be the reason for the commonly observed performance costs in such situations. Previous research suggests that in order to overcome this conflict, agents suppress their bodily sensations and rely on only the visual information from the tool to monitor their actions. According to ideomotor theory, actions are essentially generated by anticipating their perceptible effects, so the question arises whether such suppression might already emerge before the agent starts moving. We studied this by letting participants move a cursor towards a target by means of a hand movement in either the same or opposite direction to create minimal or maximal conflict between visual and proprioceptive information. Hand-to-cursor mapping was predictable. Importantly, we applied tactile stimulations to participants' hands after stimulus onset but before movement onset and asked participants to judge stimulation intensity. Participants experienced tactile stimuli as attenuated on their active hand when they controlled an inverted tool up to approximately 200ms prior to movement onset. Conversely, when tool and hand had to move in the same direction, there were signs of tactile enhancement on the active hand. These results suggest that spatially incompatible body-to-tool transformations prompt attenuation, whereas spatially compatible transformations prompt amplification of body-related perceptual processing.

Precision or gain control within the brain's body model

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When controlling action—e.g. hand movements—the brain typically relies on seen and felt posture information to represent ‘its’ body. It is thought that the brain combines these estimates into a multisensory (e.g. hand) representation in a probabilistic fashion, accounting for how reliable each estimate is in the given context. I will present behavioural, brain imaging, and computational modelling work—which jointly suggest that during action, the weights (i.e., the precision) assigned to visual vs proprioceptive information about body position can be changed in a ‘top-down’ fashion by e.g. adoption of an ‘attentional task set’. Such a contextualising function of attention on sensory evidence (a.k.a. gain control) is in line with predictive coding models of body representation, along which the expected precision of sensory prediction errors is augmented or attenuated—depending on the current context—based on internal model beliefs. I will conclude that to some degree body representations can be deliberately ‘shaped’, and will discuss what this implies for the near future—in which entertaining and switching between multiple body representations, e.g. in virtual realities, may be increasingly common.

How do visual skills relate to arithmetic and reading in elementary school? A screening study

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Vision plays an important role in learning and development. It is often assumed that visual abilities influence students’ performance, including the acquisition of basic skills such as arithmetic and reading. Here, we investigated arithmetic skills (HRT 1-4) and reading fluency (SLS 2-9) as well as basic visual skills including visual acuity (VA, LEA SYMBOLS® near test #250800), refraction (Autorefraktometer Plusoptix A09), accommodation and convergence (push-up method and continuous motion with Snellen’s E). We report results from two independent samples including 105 elementary school students in third grade (sample 1 (S1): 35 students, 16 female; sample 2 (S2): 70 students, 34 female). Our results show correlations between VA and subtraction (S1: $\tau = .22$, $p = .051$; S2: $\tau = .236$, $p = .010$) as well as between VA and reading fluency (S1: $\tau = .30$, $p = .014$; S2: $\tau = .246$, $p = .007$), indicating that students with better visual skills also perform better in these tasks. S1 included 24 students with learning difficulties (IQ > 70, HRT and/or SLS performance \leq 16th percentile; dyscalculia N = 4; dyslexia N = 10, combined N = 10). Distribution of VA differed significantly between groups: More students with learning difficulties showed lower VA ($m = 1.13$; age-appropriate VA = 1.25) than those students without learning difficulties ($m = 1.49$; $\chi^2(3) = 9.969$, $p = .002$; Cramer’s V = .534). Our study thus emphasizes the importance of visual skills for learning and might suggest a systematic link between vision and learning difficulties.

Atypical Visual Saliency in Super-Recognizers

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Individuals exhibit reliable idiosyncratic visual sampling biases towards specific semantic stimulus categories. Atypical oculomotor biases towards faces have been reported in developmental disorders. To date only one study has tested group differences in gaze biases for Super-Recognizers (SRs) - individuals with exceptional face cognition skills - focussing on gaze behavior towards faces and bodies. Here, we tested 10 SRs identified with a novel, conservative diagnostic framework and 43 controls during free viewing of complex everyday scenes to investigate potential differences in fixation biases towards multiple semantic categories: Faces, Text, objects being Touched and Bodies, as well as within Faces fixations towards Eyes and Mouths. SRs exhibited an increased bias for fixating Faces and a decreased bias for sampling Text and Touched objects, for both first fixations and cumulative dwell time. Moreover, SRs directed fewer first saccades to and spent significantly less of their face fixation time on Mouths; a similar trend emerged for Eyes. Taken together, SRs took more time scanning individual faces and showed more central face fixations. However, these group differences were accompanied by considerable variability among SRs and overlap with controls. Further work is required to determine the relationship between individual differences in visual saliency and performance across subprocesses of face cognition.

Shepard tones sabotage melodic contour coding

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Music is governed by rules to which we become sensitive to a large extent by mere listening. Artificial Grammar Learning is a paradigm to investigate this implicit learning process in the lab. In previous studies we found that humans possess a powerful syntax processor that quickly extracts melodic regularities realized on all kinds of unfamiliar musical scales, from the exotic Bohlen-Pierce Scale, to inharmonic, random and even fluctuating pitch scales. The brain apparently codes melodies in multiple representations., e.g. interval and contour information.

In an experiment we presented our participants (N = 60) grammatical melodies realized on fluctuating pitch scales, so that they should use contour instead of interval information for learning. To test this hypothesis, melodies in an experimental group were composed of Shepard tones which corrupt contour coding due to the circular pitch they elicit. A control group received melodies composed of pure tones instead. After being exposed to a set of grammatical melodies for roughly 30 Minutes, participants had to discriminate grammatical from ungrammatical (random) melodies in a subsequent test. Results showed that the Shepard group performed significantly worse than the pure tone group. As expected, Shepard tones sabotaged contour coding.

Credit assignment errors and error monitoring in dual-tasking

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In daily life, we perform multiple actions simultaneously all the time. In such a scenario, the capability not only to distinguish single subtasks as correct or erroneous, but also to trace back the source of an error within multiple, potentially simultaneous subtasks, is essential. If this process fails, a credit assignment error occurs, meaning an actually correct subtask is labelled erroneous, while an erroneous subtask goes without notice. Research on dual-tasking suggests that error monitoring processes within such scenarios can be divided into a subtask level and a superordinate level that considers the whole dual-task. We hypothesize that error monitoring needs to take into account both theses monitoring levels to achieve the goal of correctly attributing the erroneous task within a dual-task setting. We conducted two experiments with PRP paradigms in which participants reported their presumed errors and the associated subtask after each trial. Monte Carlo simulations provided evidence for credit assignment errors being a type of error that span the whole dual-task and occur more frequent than would be expected from individual subtasks' error reports. A logistic regression could show that their frequency depends on temporal proximity, as measured by the stimulus onset asynchrony, as well as spatial proximity of the response keys. We conclude that credit assignment errors are indeed monitored on the dual-task level but subtask level monitoring processes influence this dual-task level monitoring.

Episodic memory in preference reversals

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The finding that individual preferences are systematically inconsistent under different but formally equivalent modes of information processing is called the preference reversal (PR). To date, neither has literature in gambling situations paid attention to whether the difference in expected value between bet pairs affects the likelihood of PR, almost nor has empirical research shed light on whether episodic memory leaves traces in PR tasks. In a laboratory-based study, we systematically varied bet pairs in expected value in a more market-like scenario. Undergraduates (N = 64) not only completed classic dual-procedure PR tasks, but also made conscious memory of previous choices in a recognition test. Consistent with past work, participants exhibit systematic PR between choices and valuations. Critically, we found a tendency that the larger the expected value, the larger the predicted PR. Moreover, correct retrievals of initial choices could attenuate predicted PR. The overall results not only indicate context-dependent nature of PR phenomenon, but also provide evidence about how retrieval operates as individuals perform PR-alike multiple tasks, with fuzzy-trace theory being illustrative of this idea.

The relationship between performance and the development of explicit knowledge in an incidental learning situation

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Recent studies in implicit learning focus on the question how implicit acquired knowledge might become consciously aware.

For the serial reaction time task (SRTT), Haider and colleagues (e.g., Haider & Frensch 2005) propose, for example, that an unexpected change in one's own behavior (e.g. premature responses) can trigger search processes. The outcome of these search processes is what becomes aware. A consistent empirical finding is that participants who gain explicit knowledge show a sudden decrease in reaction times. Haider and colleagues (e.g., Haider & Rose, 2007) proposed that the so called RT-drop shows the point of time when explicit knowledge occurs.

Here we investigated whether the RT-drop is a necessary precondition to develop explicit knowledge. To answer this question, we manipulated the timing of long and short response stimulus intervals (RSI). For participants in the experimental condition, the different RSIs were presented in blocks while they changed randomly in the control condition. We expected that the blocked RSI presentation should facilitate the expression of a RT-drop. In the control group, the randomly changing RSIs should hamper the expression of a RT-drop because of the unpredictable timing.

In line with our assumptions, we found that more participants of the experimental condition than of the control condition showed a RT-drop. However, the amount of explicit knowledge did not differ between these two conditions.

The findings suggest that the RT-drops accompany the development of explicit knowledge. However, it does not seem to be a necessary presupposition to develop explicit sequence knowledge.

The role of the group in the relationship between social exclusion and a radical mindset

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Systematic observations and first empirical data suggest that social exclusion might be a powerful condition that allows terrorism to flourish. Addressing the question of the underlying mechanism of this effect, previous research indicated that increased individual sensitivity might play a role. However, since social exclusion intensifies group processes even to extreme levels, we suggested that it might also promote group processes that push excluded individuals towards a radical mindset. In the present study (N = 60) we experimentally manipulated social exclusion vs. inclusion in a real-life scenario and created an artificial in-group using validated paradigms. After that, group processes were tested and data on the participants' radical mindset were collected. Results revealed that excluded participants showed a greater willingness to join a terroristic organization and to commit property damage on behalf of it. Importantly, this effect was mediated by increased levels of perceived group threat and group polarization. Consistent with previous research, the current study illuminates the power of groups in gaining a radical mindset.

Visualizing mental representations by evolving them from noise

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Seeing involves not only our immediate surroundings, but also visual memories and expectations. When we search for our favourite mug, we keep its appearance in mind. The content of such mental representations is of great interest in perceptual and cognitive psychology, yet is challenging to measure experimentally in detail. One previously-proposed approach is reverse correlation. For example, participants are asked to report whether they see a signal—e.g., the letter “s”—in pure noise. Over enough trials, some random noise samples will happen to resemble the signal the participant has in mind. Averaging over all trials in which a participant spuriously detected a signal provides a “classification image” — a visualisation of their representation of the letter. One major drawback of reverse correlation is that it requires tens of thousands of trials. Perhaps more importantly, it cannot recover multiple concurrent templates. If a participant imagined both print and cursive instances of the letter “s”, the recovered classification image would be a jumble of both. We address these issues using a genetic algorithm approach. We generate image populations by crossbreeding noise. On each trial, participants are presented with multiple alternative images. Across generations, only those images in which participants detect a signal are kept for further breeding. In both simulation and experiments with human participants, we demonstrate that this method converges faster than standard reverse correlation and can even recover multiple internal representations of a signal. Our approach thus provides an efficient, data-driven way to directly probe mental representations.

Transfer of training-related improvements between reading and visual exploration: effects of a combination training

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Homonymous hemianopia is a debilitating visual field disorder that affects patients’ ability to read and explore their environment. Compensatory training programs have been shown to improve reading and visual exploration through systematic oculomotor training. However, improvements in training-related performance have so far been task-specific, with reading training only improving reading parameters and visual exploration training only improving visual exploration. We developed a novel exploration training that includes words and sentences to train both reading- and exploration-specific eye movements. The effects of this training on reading and visual exploration performance are compared to the effects of an exploration training with shape stimuli. Healthy participants with either right or left simulated hemianopia are randomly assigned to one of the two training groups. Measures of reading and visual exploration performances with and without simulated hemianopia are taken on the first day of study participation. Participants then complete three training sessions à 45 minutes each on three consecutive days. Each session is followed by a test of reading and exploration performance to detect possible training-induced changes. We expect our findings to provide an insight into whether a transfer of training-related improvements between reading and visual exploration can be achieved by designing a training that combines both relevant tasks.

When time passes by: An EEG-study on the involvement of different alpha sub-bands before and during temporal reproduction

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Accurate timing and temporal information processing is crucial for human action and (cognitive) functioning. However, the perceptual, cognitive and neurophysiological underpinnings of temporal information processing are still under debate. Neurophysiological studies investigated the role of the alpha-band in the EEG during the processing of durations. Results of these studies, however, are inconsistent. This inconsistency might be due to the neglect of dividing the alpha-band into its sub-bands, which have been shown to be related to different cognitive processes. While the upper alpha-band (10-12 Hz) seems to be related to semantic memory, the lower alpha-band (8-10 Hz) is associated with alertness-related expectancy and arousal.

To test the idea that lower and upper alpha-band are differentially related to temporal processing, a sample of 40 undergraduate students (age 18-35 years) performed a temporal reproduction task (TRT) while their EEG was measured. In the TRT, a target interval is presented per trial followed by a reproduction interval, which is stopped by participants, when they believe that the reproduction interval equals the target interval. Our exploratory analyses will focus on the activity of the upper and the lower alpha-band during temporal encoding of the target interval and the reproduction compared to the resting-state.

Changes in valence-dependent neural correlates of augmented feedback processing after extensive motor sequence learning

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Several event-related potentials are associated with the valence-dependent processing of augmented feedback during motor learning. In this study, 38 students learned a sequential arm-movement task with 192 trials in each of five practice sessions (960 practice trials in total), to examine practice-related changes in neural feedback processing. EEG was recorded time-locked to feedback onset in the first and last practice session. An adaptive bandwidth for movement accuracy led to equal frequencies of positive and negative feedback. The 'feedback-related negativity' (FRN) is assumed to reflect prediction errors in reinforcement learning. In this study, the peak in the FRN time-window was more negative for negative feedback. This negativity increased after extensive practice, indicating that smaller errors are harder to identify in the later phase. The late fronto-central positivity (LFCP) was more positive for negative feedback in the first and last practice session, indicating that supervised learning based on a comparison of the current and the desired output is operative in both phases. The P300 displayed a higher amplitude for positive feedback, which is interpreted as the higher significance of positive feedback for the updating of internal models in this setting. A valence-independent increase of the P300 amplitude might reflect an improved ability to update the internal representation. These results demonstrate that valence-dependent feedback processing changes with extensive practice of a novel motor task.

Crisis Management: A mindfulness induction promotes positive reappraisal of action crises towards personal goals

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Achieving goals has long been associated with positive psychological health outcomes, especially goals pursued because one truly values them, or finds them fun (e.g., Koestner et al, 2002). But what happens when obstacles accumulate to such an extent that one starts to doubt one will achieve one's important, identity-defining, goals (e.g., career goals)? Such hesitations between further pursuing and disengaging from important personal goals are known as action crises (Brandstätter & Schüler, 2013). Action crises have been associated with poorer psychological health (e.g., increased depression and anxiety), as well as reduced goal progress and increased goal disengagement (Brandstätter & Herrmann, 2016; Holding et al., 2017). This presentation will focus on coping strategies people can use once they are experiencing an action crisis. An experimental study (N=122) showed that mindfulness can improve coping skills to help people deal with action crises. Participants first identified an important goal that they were currently pursuing along with their goal motivation (autonomous and controlled) and action crisis levels for that goal. Then, they were either guided through a mindfulness meditation or read magazines for 15 minutes. Those in the mindfulness condition selected more adaptive emotion regulation strategies when facing a personalized action crisis scenario than those in the magazine condition. This effect was obtained even when controlling for goal motivation and initial action crises levels. The implications of these findings will be discussed and theoretically situated within the Rubicon model of Action Phases (Gollwitzer, 2012).

The poetry and truth of interoceptive measures: relating behavioral to physiological markers

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Collecting objective measures of interoception has long posed a challenge. Recent studies have focussed on the heartbeat evoked potential (HEP) as an objective, physiological marker of interoceptive processing. Similarly, more accurate tests of interoceptive abilities, such as the heartbeat detection task, have been developed. This task presents participants with a series of tones synchronised to participants' own heartbeat. The time between the heartbeat and the presentation of the tone is varied across different onset asynchronies. Good heartbeat detectors are identified by showing a preference for one or two of the onset asynchronies in which they perceive the tone as an accurate reflection of their own heart. We presented 25 participants with the heartbeat detection task, varying stimulus onset asynchrony across five time bins ranging from 0 – 500ms post heartbeat. Simultaneously, we recorded the EEG to investigate whether good heartbeat detectors would show concurrent changes in HEP amplitude. Additionally, participants completed an emotion regulation task in which they viewed neutral or aversive pictures from the IAPS database. Pictures were presented five at a time in quick succession. After each neutral or aversive presentation interval, participants were asked to rate their levels of arousal. The criteria of the heartbeat detection task identified nine of 25 participants as good heartbeat detectors. These individuals showed a clear preference for tones at 0 and 100ms. We found that relative to poor heartbeat detectors, good heartbeat detectors had significantly higher HEP amplitudes in these same time bins. Furthermore, good heartbeat detectors reported significantly lower arousal levels towards the aversive images in the emotion regulation task. Our findings provide initial evidence that the heartbeat detection task is an accurate measure of

interoceptive accuracy which coincides with physiological markers of interoception and an enhanced ability of emotion regulation.

The impact of disengagement on spatial episodic memory

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Disengaging from the external world – a phenomenon referred to as mind-wandering – is a ubiquitous experience that has been shown to be associated with detriments in cognitive performance across a large range of tasks. In the current study (N=19), we investigated the impact of task disengagement on spatial episodic memory. Subjects were presented with 10 blocks of 85 visual stimuli positioned on a centered grey circle. During this phase, randomly interspersed thought probes were used to assess self-reported mind-wandering. In the recall phase, subjects had to position the previously encoded stimuli. The key dependent variable was recall error, which is the difference between the original position of objects at encoding and the estimated position at recall. Preliminary results showed that being disengaged from the task during encoding was associated with worse memory performance. Further, the findings highlight the potential of assessing task disengagement by thought probes in order to shed light on the role of sustained attention in spatial episodic memory. We discuss these findings in terms of the dynamics of mind-wandering and the importance of not considering mind-wandering as a static experience.

Take it or leave it: The influence of shame-coping on social decision-making

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Patients with a clinical depression have shown social decision-making differing from healthy volunteers. The proneness to shame, which varies between depressive patients and healthy volunteers also impacts social decision-making. However, results are contradicting. In this study, we take into account shame-coping strategies, rather than the feeling of shame itself, to be associated with social decision-making. Four strategies from the Compass of Shame were used and summarized into internalized coping (attack self, withdrawal) and externalized coping (attack other and avoidance). In total, 97 participants (54 patients with a clinically diagnosed depression and 43 healthy volunteers) performed a modified Ultimatum Game (UG). Previous to the actual UG they performed another task and got derogatory feedback for incorrect and positive feedback for correct answers. Shame, shame-coping and depressiveness were captured via questionnaires (Test of Self-Conscious Affect-Adolescent, Compass of Shame Scale and Center for Epidemiological Studies Depression Scale, respectively). The same person, who gave that feedback was their fellow-player during the UG. Hierarchical linear regressions were performed with depression, shame and shame-coping as predictors and acceptance-rates as outcome per feedback-condition. Results show that after derogatory feedback, participants with depressive symptoms accepted more unfair offers (unstandardized $\beta = .354$; $p < .05$), whereas externalized shame-coping led to a higher rejection of unfair offers (unstandardized $\beta = -.451$; $p < .05$). The findings show that shame-coping drives aberrant social economic-decisions and stress the importance to make shame and shame-coping part of psychiatric treatment.

Crossmodal Learning

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A wealth of multisensory information is available for learning in natural environments. Sights, sounds, and kinesthetic and proprioceptive signals may all help to guide learners as they seek to acquire new knowledge and skills. There is growing consensus that the brain appears optimized to learn and remember based on information arising across sensorimotor modalities. In this symposium, we aim to provide an update on how multisensory brain mechanisms guide and enhance perceptual and cognitive learning. Ladan Shams' research on perceptual learning reveals that crossmodal interactions can benefit learning and memory, suggesting that experiments focused on exclusively unisensory processing may fail to capture multisensory mechanisms that influence unisensory perception. Evidence for this principle arises from applied studies on multisensory language learning. In a longitudinal design, Silvia Brem and colleagues demonstrate how the neural representations of graphemes change rapidly as children learn grapheme-to-phoneme mappings, reflected in both event-related potentials of the EEG and ventral occipito-temporal fMRI activation. In studies that make use of inhibitory neurostimulation, Brian Mathias and Katharina von Kriegstein demonstrate effects of visual and motor cortex integrity on the translation of foreign language vocabulary learned with gestures, suggesting that such crossmodal brain responses are causally relevant for beneficial behavioral outcomes of multisensory-based training protocols. In an fMRI adaption study conducted by Olivier Collignon and colleagues, the brain's visual word form area adapted to signed words in both hearing and deaf participants who were proficient in sign language, but not in hearing participants who lacked sign language proficiency. The same brain area showed adaptation to written words in all three groups of participants. Taken together, these studies reveal that multimodal representations develop rapidly and benefit learning outcomes. The underlying neural mechanism, however, is unclear. Some of the symposium speakers interpret their findings as a sensory simulation mechanism, and others on mechanisms that abstract from sensory features.

Causal role of visual and motor cortices in the auditory translation of foreign language vocabulary following multisensory learning

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According to predictive coding theories of multisensory learning, sensory and motor brain regions that encode multisensory information during learning may support later recognition of learned stimuli, even under unisensory recognition conditions. We tested this prediction in the context of foreign language (L2) learning using the neurodisruptive effects of inhibitory transcranial magnetic stimulation (TMS). In two experiments, participants learned L2 words and their native language translations over 4 consecutive days. Words were learned in two conditions: In one condition, participants viewed and performed gestures as L2 words were auditorily-presented, and in another condition, participants viewed pictures as L2 words were auditorily-presented. Gestures and pictures were congruent with word meanings. Following training, participants underwent effective and sham TMS as they listened to the L2 words that they had learned and translated the words into their native language. In one experiment, we targeted with TMS a visual area associated with the biological motion perception, and in the second experiment, we targeted the motor cortices. Responses in both of these regions were previously found to correlate with the behavioral benefits of performing gestures during L2 vocabulary learning. As hypothesized, TMS slowed the translation of L2 words that had been learned by performing gestures—but not pictures—compared to sham stimulation in both experiments. This

result suggests that gesture-based learning altered L2 representations within visual and motor cortices, which then influenced the translation of L2 words. Specialized sensory and motor cortices may therefore play a causal role in remembering the meanings of L2 words following multisensory encoding.

Time course of the suppression of visual priming effects by forward masks

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Milner and Goodale proposed two different ways of visual information processing, one that generates conscious experiences with the stimuli, and another that uses action-related information from visual signals. This distinction is supported by findings from neurological patients with dissociable performance deficits and dissociative effects of visual illusions in healthy participants. Backward masking experiments accord with the dual pathway perspective by showing priming effects of visual stimuli independent from conscious perception of the prime. New evidence for dissociable visual processing pathways results from the suppressive effects of visual forward masks. When a forward mask precedes the prime and the following backward masking target stimulus, the forward mask is limiting the priming effects. This suppressive effect of the forward mask depends on visual features of the forward mask. Here we examined whether the suppressive effects of forward masks depend on the duration of the forward mask and the temporal gap between the forward mask and the prime. Results revealed that the suppression of priming effects increases with the duration of the forward mask, but decreases when the inter-stimulus interval between the forward mask and the prime is increased. Findings shed new light on the processing of visual information on the path from vision to action.

The effect of 14 h fasting on task selection in voluntary task switching paradigm with food stimuli

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Traditional work on multitasking has focused on cognitive control mechanisms that underlie execution and switching between tasks. However, little research has addressed volitional and motivational aspects of task selection mechanisms. In the present study, we investigated whether the cognitive flexibility was influenced by 14h fasting. For this purpose, we used a voluntary and a cued task switching paradigm with pictorial food and neutral stimuli. Subjects (N=104) performed magnitude judgments on single digits or judgements on a type of food (salty vs. sweet). In the voluntary switching paradigm the instructions were to perform the two tasks equally often and in a random order. The preliminary results indicate a lower switch cost in voluntary as compared to cued task switching (68 ms vs. 146 ms). Fasting was associated with a lower switch cost in voluntary (but not cued) task switching. Compared to non-fasting condition, switches were significantly faster by switching to the food task and on a trend level ($p = 0.05$) by switching from the food task in fasting condition, though the number task was selected more frequently. The results show that hunger facilitates both the engagement toward and the disengagement away from the food task, but is not related to the increased preference for this task.

Sequential Collaboration: A More Accurate Alternative to Wisdom of Crowds

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In recent years, the internet has become a popular source for gathering and collecting information. Information aggregation is facilitated by collaborative websites that provide user-generated content such as Wikipedia, other Wiki-based projects, and OpenStreetMap. In such shared data sources, collaboration resembles a sequential chain that starts with the creation of an entry followed by a sequence of incremental changes made to the entry's latest version. The dependency of individual judgments in sequential collaboration could induce an implicit weighting of expert knowledge, thus increasing accuracy compared to the equally-weighted aggregation of independent individual judgments (wisdom of crowds). Therefore, we hypothesize that judgments become more accurate over the course of a sequential chain of contributions and that sequential-collaboration estimates (the latest judgment) are more accurate than wisdom-of-crowds estimates (the mean of several independent judgments). We conducted three studies examining the sequential collaboration process and comparing wisdom-of-crowds and sequential-collaboration estimates using general knowledge questions. In all studies, we found that judgments become more accurate over the course of a sequential chain and that sequential collaboration yields more accurate estimates than wisdom of crowds. While this explains the high quality of the content of collaborative projects such as Wikipedia, it also sheds light into a not yet examined collaboration process.

Better off without? Taking a closer look at temporal dynamics of goal disengagement and goal shelving

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Managing multiple goals that compete for finite resources (e.g., time) can be challenging and may lead to goal conflicts, where one goal pursuit interferes with another goal pursuit. To resolve goal conflicts, people may choose to disengage from a conflicting goal. Goal disengagement involves two distinct processes: Withdrawing current behavioral goal investments and current psychological goal commitment. Alternatively, people may choose to shelve the conflicting goal with the intention to reengage in the future. Goal shelving can be thought of as a "soft form" of goal disengagement: Withdrawing current behavioral goal investments but not psychological goal commitment.

We conducted an experiment to examine and compare processes of goal disengagement and goal shelving in the case of goal conflict. Participants worked on two conflicting task goals. After a first goal conflict phase, participants were randomly assigned to a disengagement, shelving, or conflict condition. Participants in the disengagement condition were asked to disengage from one goal and proceeded to work on the other goal for the remainder of the experiment. Participants in the shelving condition were asked to shelve one goal. They proceeded to work on the other goal in phase 2 and returned to work on the (previously) shelved goal in phase 3. Participants in the conflict condition spent the entire experiment working on both conflicting goals. Momentary motivational and emotional states were assessed twice in each phase. We present findings on temporal dynamics and on shared and distinct outcomes of goal disengagement and goal shelving.

Functional MRI examination and the efficacy of cognitive behavioural group therapy in patients with anxiety disorder and functional dizziness

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Persistent postural-perceptual dizziness (PPPD) and anxiety disorders (AD) share behavioural (anxiety, avoidance, social withdrawal, hyperarousal), and neurological symptoms (vertigo, palpitation, stance, gait disorders). Previous studies have shown a bidirectional link between vestibular and anxiety neural networks. So far, there have been no neuroimaging-studies comparing these two patient groups regarding cognitive-behavioural therapy (CBT). This study investigated whether a CBT-programme (10x120min, 2x/w) designed for PPPD and AD, is effective for both groups, whether there are differences in neural correlates pre (T1) to post (T2) treatment in and between groups, and compared findings with a healthy control group (HC). 63 participants (AD=20, PPPD=14, matched CG=29) were included. To induce anxiety during fMRI-measurements emotion-inducing pictures were shown. Subjects filled in vertigo (VSS, VHQ), anxiety (STAI, AKI) and depression (BDI-II) questionnaires. Pre-post fMRI-analysis shows significantly reduced BOLD-activations in all groups in both insula, visual cortex, gyrus frontalis inferior, cerebellum, amygdala, parahippocampal gyrus, superior temporal lobe and cingulate cortex during the picture presentation. Only PPPD shows activation in the supra-marginal gyrus, which is reduced at T2. A current analysis demonstrates a significant reduction in depression, anxiety and dizziness scores after CBT in the patient group (PPPD + AD). PPPD shows a reduction in the supra-marginal gyrus, which is a core region of the vestibular cortex. The HC reduction in activation is due to similar pictures and a familiar scanner situation. We conclude that the therapy programme is effective in anxiety and dizziness circuits, but further investigation is required.

Multifractality of eye fixations during complex visual search

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Fractality of eye-movement characteristics reveals that they are controlled by long-range, deterministic strategies. Eye fixations in standard visual search conditions are monofractal; their long-range correlations are characterized by a single scaling law (Amor et al., 2016). For a more complex task that combines visual search for multiple targets with their memorization, several strategies may compete. This should be reflected in multifractality of the eye-fixations. Two datasets using this task showed high recurrence of fixations on previously visited locations, likely made for target memorization. These refixations may occur at a time scale distinct from fixations involved in visual search. Concurrent eye movement strategies for memorization and search would result in multifractality of the fixation time series as suggested by their heavy-tailed distributions. Multifractal detrended fluctuation analyses on the eye fixation series from both datasets revealed multifractal spectrum widths in both datasets higher than for shuffled data. By demonstrating task-dependent fractality in eye fixation behaviour, our work shows that complex memory strategies can be observed in eye fixation series using methods from time-series analyses.

A new approach to detecting cheating in sensitive surveys: The Cheating Detection Triangular Model

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The randomized response technique (RRT; Warner, 1965) has been developed to control for socially desirable responding in surveys on sensitive attributes. Prevalence estimates obtained via the RRT have been shown to be more valid than estimates obtained via a conventional direct question (Lensvelt-Mulders, Hox, van der Heijden, & Maas, 2005). However, even in RRT surveys, some respondents do not follow the instructions of the RRT, perhaps because they fail to understand the questioning format or lack trust in the randomization procedure (Edgell, Himmelfarb, & Duchan, 1982; Landsheer, van der Heijden, & van Gils, 1999). To address this problem, advanced models attempt either to overcome instruction non-adherence by providing simplified instructions, as in the Triangular Model (TRM; Yu, Tian, & Tang, 2008), or to make instruction non-adherence detectable, as in the Cheating Detection Model (CDM; Clark & Desharnais, 1998). We propose the new Cheating Detection Triangular Model (CDTRM), which combines the simplified instructions of the TRM with the mechanism of the CDM for detecting non-adherent respondents. In an online survey, we investigated the known prevalence of an experimentally induced sensitive attribute that served as an external validation criterion for the prevalence estimates obtained. Based on individual-level data, we report the first strong validation of the TRM, the CDM and the CDTRM, and compare the validity, sensitivity and specificity of these models.

What if the Word Frequency Effect on Judgments of Learning Is Actually a Nonword Effect?

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Judgments of learning (JOLs) are higher for high-frequency (common) than low-frequency (rare) words. However, this result could be due to low-frequency words being so rare that participants could consider them nonwords. As nonwords are rated with lower JOLs than words, low-frequency words being considered nonwords could explain the lower JOL for low-frequency words. To test this assumption, participants studied four types of words: high-frequency words; low-frequency words with high subjective frequency (i.e., more likely to be known by participants); low-frequency words with low subjective frequency (i.e., more likely to be unknown to participants); and nonwords. Participants provided immediate JOL for each item. Then, they completed a lexical decision task and, finally, a recall test. If the word frequency effect on JOLs is due to low-frequency words acting as nonwords, JOLs for nonwords and low-frequency words with low subjective frequency should be similar and lower than JOLs to high-frequency words and low-frequency words with high subjective frequency. Results showed that JOLs followed a stair-like pattern, with the highest JOLs attributed to high-frequency words and the lowest JOLs attributed to nonwords. Response times in the LDT decreased with increasing frequency, mediating the word frequency effect on JOLs. Recall performance was best for high-frequency words, worse for nonwords, but did not differ between the two types of low-frequency words. Our findings suggest that the word frequency effect on JOLs is based on both objective and subjective frequency and is not a mere nonword effect.

Investigating anticipatory processes during sequentially changing reward prospect: An ERP study

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The prospect of performance-contingent reward modulates cognitive control in favor of either increased cognitive stability or flexibility: While unchanged high reward prospect has been found to induce more stable behavior, increasing reward prospect leads to more flexible behavior (Fröber & Dreisbach, 2016). However, so far the underlying processes are not well understood. To gather more insight, we measured reward-cue-locked event-related potentials (P2, P3b, and the contingent negative variation [CNV]) while participants switched (voluntarily) between cognitive tasks that were preceded by reward cues of changing magnitude.

Behavioral data again showed increased flexibility when reward prospect increased (smaller switch costs, higher voluntary switch rates [VSR] whereas unchanged high reward promoted stability [higher switch costs, lower VSR]). Consistent with previous studies, P2 amplitude was modulated by the current reward magnitude (i.e., low vs. high reward) whereas the CNV was influenced by the reward sequence (remain low, increase, remain high, decrease), with the smallest amplitude for unchanged low reward. Interpreting the CNV as a marker for response preparation, this indicates the poorest preparation when reward remains low. More importantly, we found the earliest effect of the reward sequence in the P3b component: the largest amplitude was obtained with increasing reward prospect. We discuss this P3b as an indicator of context updating in working memory which eases task switching and flexibility.

Measuring Achievement, Affiliation, and Power Motives in Mobility Situations: Development of the Multi-Motive Grid Mobility (MMG-M)

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In the current study, we introduce the Multi-Motive Grid Mobility (MMG-M) in an age-stratified sample (N = 206) that aims to disentangle six motive components – hope of success, hope of affiliation, hope of power, fear of failure, fear of rejection, and fear of power – in mobility-related and mobility-unrelated scenarios. Similar to the classical Multi-Motive Grid (MMG), we selected 14 picture scenarios half of which representing mobility and non-mobility situations. The scenarios were combined with the 12 statements from the MMG. Both the MMG-M and MMG were assessed to allow comparability between psychometric criteria. The results of confirmatory factor analyses yielded a good model fit for a six-factor solution with an additional mobility factor for the MMG-M. Interscale correlations also indicated higher correlations within than between hope and fear components, suggesting hope and fear clusters in the MMG-M. Internal consistency of the items was similar to the MMG. Lastly, we tested the external validity of the MMG-M by assessing mobility-related variables such as risk awareness and physical constraint. We found that risk awareness was positively related to all fear components in both mobility and non-mobility scenarios whereas physical constraint was positively associated with all fear components but only in mobility situations.

The speed prior account: Explaining localization biases of moving stimuli with prior speed expectations

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For the localization of the first (onset) or final (offset) location of a dynamic, moving stimulus, systematic perceptual shifts in (forward) as well as against (backward) the direction of motion have been consistently reported, including the Fröhlich effect, Representational Momentum effect, Onset-repulsion effect, and Offset-repulsion effect. In the present study, we propose a new theory to unite the existing evidence under one framework: the speed prior account. The perceived location is hereby the combination of the sensory input, which is associated with uncertainty, and a prior expectation about stimulus speed. Discrepancies between the prior speed expectation and actual stimulus speed lead to a distortion of perceived stimulus speed, resulting in the aforementioned localization biases. In this study, we additionally tested the predictions of the new speed prior account directly against the predictions of the classical localization theories (e.g., the activation or vector addition models) in two tactile experiments (N = 30 each). Systematically manipulating stimulus speed, a clear data pattern was observed. For the onset location, a backward-shift (Onset-repulsion effect) was found, which turned into a forward-shift (Fröhlich effect) with increasing speed. For the offset location, this data pattern was reversed. In particular, a forward-shift (Representational Momentum effect) in motion direction was evidenced, which decreased with increasing speed, replicating previous evidence. Furthermore, perceived onset and offset location reveal strong interdependencies at the single-participant level. These results are in line with the predictions of the new speed prior account, and challenge the classical localization theories in the literature.

Deep neural network model of haptic saliency

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Haptic exploration usually involves stereotypical systematic movements that are adapted to the task. Here we tested whether exploration movements are also driven by physical stimulus features. We designed haptic stimuli, whose surface relief varied locally in spatial frequency, height, orientation, and anisotropy. In Experiment 1, participants subsequently explored two stimuli in order to decide whether they were same or different. We trained a variational autoencoder to predict the spatial distribution of touch duration from the surface relief of the haptic stimuli. The model successfully predicted where participants touched the stimuli. It could also predict participants' touch distribution from the stimulus' surface relief when tested with two new groups of participants, who performed a different task (Exp. 2) or explored different stimuli (Exp. 3). We further generated a large number of virtual surface reliefs (uniformly expressing a certain combination of features) and correlated the model's responses with stimulus properties to understand the model's preferences in order to infer which stimulus features were preferentially touched by participants. Our results indicate that haptic exploratory behavior is to some extent driven by the physical features of the stimuli, with e.g. edge-like structures, vertical and horizontal patterns, and rough regions being explored in more detail.

A Fallacy in Unconscious Priming Research: When can scientists truly claim an Indirect Task Advantage?

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Many studies in the field of priming claim that masked prime stimuli are processed without participants' conscious awareness of these stimuli. Evidence is often based on two tasks: In the direct task, participants try to discriminate the primes and perform close to chance level. This is seen as evidence that participants have no conscious awareness of the primes. Nevertheless, the same prime stimuli produce clear priming effects on behavioral or neuro-physiological measures in an indirect task where participants respond to another target stimulus (e.g., congruency effects on reaction times). This is seen as evidence that responses in the indirect task had a higher sensitivity to the prime stimuli than responses in the direct task. Such an indirect task advantage (ITA)—a larger sensitivity of responses in the indirect than direct task—is then taken as evidence for the existence of processing without conscious awareness. However, the standard reasoning to infer an ITA is flawed for statistical reasons. We present a method to reanalyze existing studies based on the typically published summary statistics. This allows to directly test for an ITA, which is a prerequisite for claims about unconscious processing. We reanalyzed 15 highly influential studies (with a total of 3277 citations in WebOfScience) showing that—contrary to the original claims of these studies—there is little evidence for ITAs in most of these studies. We propose appropriate methods to infer ITAs and argue that the unconscious priming literature needs serious reassessment.

Individual Differences in Cognitive Offloading: A Comparison of Intention Offloading, Pattern Copy, and Working Memory Capacity

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The cognitive load of many everyday life tasks exceeds known limitations of working memory. One strategy to compensate for information overload is cognitive offloading which refers to the externalization of cognitive processes such as reminder setting instead of memorizing. There appears to be remarkable variance in offloading behavior between participants which poses the question whether there is a common factor influencing offloading behavior across different tasks tackling working memory processes. To pursue this question, we studied individual differences in offloading behavior between two well-established offloading --paradigms: the intention offloading task which tackles prospective memory processes and the pattern copy task which tackles continuous working memory load. Our study also included an unrelated task measuring working memory capacity. Each participant completed all tasks twice on two consecutive days in order to obtain reliability scores. Despite high reliability scores, individual differences in offloading behavior were uncorrelated between the two offloading tasks. In both tasks, however, individual differences in offloading behavior were correlated with the individual differences in an unrelated working memory task. Our results therefore show that there is not one common factor driving offloading behavior across tasks. We discuss the implications of this finding for future research investigating the interrelations of offloading behavior across different tasks.

Theta rhythmic attentional enhancement of alpha rhythmic perceptual sampling

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Accumulating evidence suggests that visual perception operates in an oscillatory fashion at an alpha frequency (around 10 Hz). Moreover, visual attention also seems to operate rhythmically, albeit at a theta frequency (around 5 Hz). Both rhythms are often associated to "perceptual snapshots" taken at the favorable phases of these rhythms. However, less is known about the unfavorable phases: do they constitute "blind gaps," requiring the observer to guess, or is information sampled with reduced precision insufficient for the task demands? As simple detection or discrimination tasks cannot distinguish these options, we applied a continuous report task by asking for the exact orientation of a Landolt ring's gap to estimate separate model parameters for precision and the amount of guessing. We embedded this task in a well-established psychophysical protocol by densely sampling such reports across 20 cue-target stimulus onset asynchronies in a Posner-like cueing paradigm manipulating involuntary spatial attention. Testing the resulting time courses of the guessing and precision parameters for rhythmicities using a fast Fourier transform, we found an alpha rhythm (9.6 Hz) in precision for invalidly cued trials and a theta rhythm (4.8 Hz) in the guess rate across validity conditions. These results indicate that the perceptual alpha rhythm reflects fluctuations in spatial resolution, while the attentional theta rhythm provides periodic enhancement of this resolution. We propose a tentative model for this interplay and argue that both rhythms result in an environmental sampling characterized by fluctuating spatial resolution, speaking against a strict succession of blind gaps and perceptual snapshots.

The influence of moral labels on cooperation and costly punishment in a Prisoner's Dilemma game

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In two experiments, we examined the effects of moral labels on cooperation and punishment. Participants played a Prisoner's Dilemma game in which the participants and their partners had the options to either cooperate or to defect. These behavioral options were associated with moral labels ("I cooperate" and "I cheat") in a moral-framing condition while they were associated with neutral labels ("A" and "B") in a neutral-framing condition. After each round of the Prisoner's Dilemma game, participants had the opportunity to punish their partners by spending small amounts of money to reduce their partners' payoffs. In both experiments, participants were more likely to punish defective partners morally and hypocritically when moral labels were used than when neutral labels were used. Participants punished their partners unilaterally in Experiment 1 while participants were morally punished by their partners in Experiment 2 in which the moral labels increased not only the participants' willingness to punish their partners, but also their willingness to cooperate in comparison to the neutral-framing condition. The results suggest that the activation of social norms through moral framing increases people's willingness to punish the defective behaviors of others. Furthermore, moral framing increases cooperation when cooperation is enforced by punishment.

I hate your face. Changes in the visual mental representation of opponent faces due to conflict.

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Top-down social information has been shown to alter face perception and evaluation. Yet, only few studies have been conducted that investigate the influence of social context on the direct visual representation of faces.

In a set of two studies, we investigated how directly experienced conflict is integrated into visual mental representations of interaction partners. We employed a reverse correlation task to capture implicit mental representation of the opponents' face. Participants were presented with varying noise-based alterations of the original image of the opponent and tasked to choose which image most accurately fits their memory. Opponent faces recreated by participants that engaged in a highly provoking interaction were judged as less trustworthy and less likable. These judgements were obtained from an unrelated second sample of participants and completely free of social context. A quantification of change in image features revealed mainly differences around the mouth corners and eye region, which could be indicative of a subtle shift in facial expression. In a second study, we varied the outcome of each conflict interaction. Opponents expressing pain were represented as more submissive and more trustworthy when compared to opponents that expressed anger. These results provide insights into the modulation of facial representation based on social information and personal motivation.

Dissociating premotor response selection and motor response activation in dual-tasking: An electrophysiological analysis

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We combined behavioral measures with electrophysiological measures of motor activation (i.e., lateralized readiness potentials, LRPs) to disentangle the relative contribution of premotor and motor processes to multitasking interference. Specifically, we presented stimuli of two tasks (primary and background task) in each trial, but participants were instructed to only perform the background task if the primary task required no response (i.e., prioritized processing paradigm). As expected, task performance was substantially influenced by a task probability manipulation: Background task responses were faster and backward compatibility effects were larger when there was a larger probability that this task required a response. Critically, stimulus-locked and response-locked LRP analyses indicated that these behavioral effects were not driven by background task motor processing (e.g., response activation) taking place during primary task processing. Instead, the results suggest that these effects were exclusively localized during premotor stages of processing (e.g. response selection). We suggest that multiple information sources can be processed in parallel depending on task relevance, but a primary and still active task goal prevents motor preparation related to the goals of other tasks.

Binding in Action Planning

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An essential part of action control refers to the top-down processes preceding an action's eventual execution. The BRAC framework construes the underlying mechanisms of action planning as activation and binding of features of anticipated action effects. While actions can have almost countless effects, the vast majority of studies has focused on the spatial features “left” and “right” to describe planned body movements. This leaves some uncertainty as to whether other spatial features or non-spatial features are bound to action plans as well. In two online studies, we found evidence for the integration of the spatial action features “top” and “bottom” and, to a smaller extent, of the temporal features “short” and “long” into corresponding action plans. Such feature integration became apparent only, however, when there was sufficient uncertainty regarding which of these features will be needed in the next moment to form a corresponding action plan. This observation might have important methodical implications for the future study of feature binding in action planning.

Distractor modality affects the inhibition of irrelevant spatial codes: Evidence from mouse movement trajectories in an accessory Simon task.

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Lateralized responses to central targets are slowed-down when a distractor is presented contralaterally (incongruent trial) as compared with ipsilaterally (congruent trial) to the response side. This so-called accessory Simon effect decreases and even reverses with increasing distractor-target intervals, indicating that irrelevant spatial codes are inhibited. Recent findings propose that the strength of inhibition is affected by matching target-distractor modalities.

In the present study, participants responded to the shape of a central target by moving a mouse cursor from a central position to the upper left or right corner of the screen. A lateralized visual (Exp. 1) or auditory (Exp. 2) distractor occurred prior to or simultaneously with a visual target. Response times, error rates, and cursor movement trajectories were analyzed. Moreover, response time latencies were separated into the time between target onset and response onset (initiation time) and the duration of the subsequent movement (movement time).

A Simon effect was obtained for all latency measures and decreased with increasing intervals. Importantly, the Simon effect reversed in response time and movement time measures only in Experiment 1. The trajectory analysis supplemented these findings: Mouse movements generally veered towards the distractor location with short intervals, but veered away from the distractor location with longer intervals only in Experiment 1. The results indicate that (1) spatial distractor codes and as well as their inhibition affect response execution and (2) inhibition is more strongly applied when the distractor is presented in the target modality.

Do different time perception trainings impact individual task-switching performance?

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In the self-organized task switching paradigm, participants either categorize a letter as vowel or consonant or a number as odd or even and they can freely decide which of the two tasks they want to perform in each trial. The stimulus needed for the just performed task is presented delayed and this delay increases with the number of consecutive task repetitions. Thus, participants need more time for task repetitions due to increasing waiting times. On the other hand, if participants switch tasks, reaction times for task performance increase because task switching results in switch costs (increased reaction time in switch rather than repetition trials). Previous results in the self-organized task switching indicate that individuals can trade switch costs and waiting time for the repetition stimulus and therefore can flexible adapt their switching behavior to some degree. In the present experiment, we investigate whether different types of time perception training have an impact on the tradeoff between switch costs and waiting time. After assessing the baseline measure for this tradeoff, one group was trained to estimate the waiting time, a second group to estimate the reaction time, and a third group was trained to estimate both, waiting time and reaction time, while a fourth group served as control group. Results show largely reduced switch costs in the three training groups and contrary to our expectations, the tradeoff between switch costs and waiting time seems to be reduced. We discuss whether the reduced variability in switching costs may cause the outcomes.

Examining automatic stereotyping from a propositional perspective: Is automatic stereotyping sensitive to relational and validity information?

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Automatic stereotyping refers to behavior that is in line with stereotypes and is emitted under automatic conditions. Research has long been dominated by the idea that automatic stereotyping reflects the activation of associations. The present research was inspired by an alternative perspective which suggests that automatic stereotyping is mediated by the activation of propositional representations. Based on this perspective, we predicted that automatic stereotyping will be sensitive to the validity of stereotype-based information, and to the relational nature of the information. Three preregistered experiments (total N = 595) found support for these predictions. Experiment 1 found that automatic stereotyping is sensitive to validity information that questioned the truth value of information about the traits of groups. Experiments 2-3 showed that automatic stereotyping is sensitive to information about the specific way in which paired groups and traits are related. We discuss the implications of these findings for research on automatic stereotyping.

Mental Health Force: Assessing and promoting mental health amongst police officers

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Police officers are continuously exposed to different stress sources, involving unpredictable, potentially dangerous, and even traumatic situations that threaten these professionals' mental health and increase their likelihood of developing mental health problems (e.g., depression, anxiety, post-traumatic stress). Although there are many qualified training initiatives for police officers' psychological well-being, Portugal still needs to develop further training and programs regarding this topic as other countries have done (e.g., the UK). Given our current pandemic situation, this concern has become even more prominent. Thus, this research proposal's uniqueness is threefold: to compare in Portugal, Spain and the UK training available concerning mental health for police officers; and assess and compare police officers' clinically relevant psychological symptoms, self-regulation, and interpersonal skills. Afterwards, we aim to develop in Portugal a program focused on promoting police officers' mental health and relevant skills for their intervention in society and crisis situations.

The impact of errors on N-2 repetition cost

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In the last decades a great deal of studies has investigated cognitive control adjustments following high-conflict trials, including errors. Most of the studies conducted thus far have used single-task paradigms. At the same time, multitasking research has often overlooked the impact of errors on performance, excluding post-error trials from analysis. However, compared to single-task situations, using more than one task offers the possibility of moving beyond the study of adjustments elicited by conflict at the response level, and to focus on the consequences of conflict arising between task sets. In three task-switching studies we assessed the impact of applying a currently irrelevant task on N-2 repetition cost, an effect consistently related to task-set inhibition. Based on previous literature reporting a task-switch benefit after task-error commission we intended to test the idea that erroneously performing a task leads to its automatic strengthening. As such, we predicted N-2 repetition cost to be decreased after task-error commission in trial N-2, relative to correct task sequences. Additionally, we also expected error commission to trigger a slowly building control mechanism that would counteract the effects of such automatic strengthening. In line with these ideas, N-2 repetition costs following N-2 errors were found to be abolished if responses in trial N-1 were fast, but were well present when the N-1 response was slow. Our results speak both to the importance of automatic associative processes in task switching and to research on post-error behaviour, in which cognitive control adjustments following task errors have been rarely investigated.

Insights about generalization, from studies on infants, adults, and bumblebees, in different tasks and across sensory modalities.

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One remarkable characteristic of biological intelligence is the capacity to generalize. Humans, even at an early stage of development, can generalise accurately from very few samples. This generalisation from little data in biological organisms contrasts strikingly with machines that paint in the style of artistic masters, beat Go grandmasters, and rival humans at object recognition, but rely on training with ‘big data’. This symposium will present diverse perspectives on generalisation in biological organisms with the goal of revealing fundamental principles and problems common across disciplines. The first two talks will cover generalization in bumblebees and human infants in the context of how evolutionary processes shaped generalization behavior. Dr. Rands will describe how bumblebees generalize from one modality (patterns of scent) to another (visual patterns). Dr. Wertz will discuss the specific ways that infants generalize information about plants. The remaining talks will focus on generalization within human adult vision, but across different visual dimensions. Dr. Witzel will focus on how we communicate across colour to reveal how we recognize objects, Mr. Tiedemann will show how we generate shapes of novel objects from single exemplars, and Dr. Wu will describe a Bayesian function learning model as a mechanism to explain how we generalize in complex spatial environments. Finally, Dr. Morgenstern will briefly discuss the similarities and differences within these works, which will be followed by a panel discussion about generalization.

Basic principles of generalization in biological systems

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Generalization is one of the most basic and least understood capabilities of biological systems. For example, to date, there is no artificially created system that can mimic generalization in human visual or concept learning. At the same time, research on generalization in biological systems spans different species, infants and adults, and many phenomena from the perception of plants, colours, and shapes to the formation of concepts. What can we learn about generalization when considering research across fields? Are there basic principles, such as Shepard’s generalization function, that are ubiquitous? Are there insights from one field that might benefit another? Here we provide a selective review of the similarities and differences between previous research in different fields. We highlight that while there are many possible ways to generalize, often the most efficient and behaviourally important strategies win. We discuss how using an interdisciplinary approach may help progress our understanding of generalization and build a model that is more reminiscent of biological systems.

How personal and social optimism associates with brain structure and function.

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Optimism bias refers to the tendency to see desirable events as being more likely to happen to oneself than undesirable events. Such biases are important for mental health and may extend to other individuals or social groups (social optimism biases). Here we test whether social optimism biases relate to brain structure and function using magnetic resonance imaging. Our experiment had participants rate the likelihood of future events happening to members of different groups. Using sparse canonical correlation analysis (sCCA) we associated optimism datasets including measures of social and personal optimism bias, trait optimism, and related concepts with 1) cortical thickness data and 2) resting state functional connectivity data. We found a significant and reliable association of a defensive self-enhancement dimension with the cortical thickness of the insula and inferior frontal cortex. We found that the primary sCCA component was positively connected to personal and social optimism bias and negatively connected to dispositional personal pessimism. The brain structure related self-enhancement dimension included unfavorable biases toward unpopular out-groups and indicators of personal optimism and pessimism. This finding was underpinned by a similar optimism-pessimism dimension associated to functional connectivity. Our results suggest a shared biological substrate for expectancies that subserve the promotion of the self and those regarding the denigration of unpopular out-groups. The existence of such a shared substrate may render society-wide efforts to counteract stereotyping particularly difficult because the reduction of undesired social biases may negatively affect the substrate that subserves the establishment of – generally adaptive – personal optimism biases.

Modality-specific effects of fatigue in multi-tasking

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The mechanisms underlying increased modality-specific dual-task-costs in the comparison of modality-compatible stimulus-response mappings (e.g. visual-manual, auditory-vocal) and modality incompatible mappings (e.g. visual-vocal, auditory-manual) remain elusive. To investigate, whether non-overlapping mechanisms are at work in simultaneously processing both types of modality mappings, we induced mental fatigue in a dual-task context. We expected a selective increase in modality-specific dual-task costs after modality incompatible fatigue induction compared to modality compatible fatigue.

We tested a group of thirty young individuals (19-30 years) in an online pre-post design, in which participants completed a 90 minutes time-on-task intervention with a dual-task comprising either compatible or incompatible modality mappings. Pre and post sessions contained single and dual-tasks in both modality mappings. In addition to behavioral performance measurements, seven subjective items (effort, focus, fatigue, motivation, frustration, mental and physical capacity) were analyzed.

Mean dual-task performance during and after the intervention indicates a training effect instead of the presumed fatigue effect, i.e. both intervention groups showed a reduction in dual-task-costs for their trained compatibility mapping. Still, participants reported increased fatigue and among others reduced mental capacity after the intervention. Additionally, individual dual-task performances were related to subjective fatigue ratings during the intervention. Interestingly, group-specific behavioral fatigue effects were present for single-task performance: participants who completed the modality

incompatible intervention showed a selective reduction in performance for modality incompatible single-tasks.

This dynamic interplay of training and fatigue effects suggests that high control demands were involved in the prolonged performance of a modality incompatible dual-task, which are separable from modality compatible dual-task demands.

The Banker Effect

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The well-substantiated Cheerleader Effect proposes that individuals featured in groups are perceived to be more attractive compared to when they are presented in isolation. The initial explanations of this effect revolved around perceptual mechanisms of the visual system. However, in subsequent studies, various hypotheses derived from the perceptual models failed to be supported. If the effect were instead to stem from non-perceptual mechanisms such as emotional influences or decision biases, then other traits besides visual attractiveness might be influenced by group settings as well. Thus, we tested whether isolation vs. group setting also impact presumed intelligence and presumed salary of individuals. This led to the discovery of the Banker Effect: Individuals featured in groups are perceived to be earning higher salaries (significant) and to be more intelligent (barely significant) compared to when these individuals are presented in isolation. Following several pilots with a demonstrable effect, the main study – which we present here – was conducted using 32 subjects in a within-design over 4 subsequent days with a stimulus set based on 78 individuals. A replication study with a larger n is currently underway. Interestingly, Cheerleader Effect and Banker Effect do not co-occur systematically within the same stimulus, which indicates that the Banker Effect is not a mere by-product of the Cheerleader Effect. Nevertheless, here we speculate that both effects may have a common sociobiological origin.

Face Adaptation Effects to Non-Configural Face Information

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Previously inspected faces can affect the perception of faces seen subsequently. The underlying mechanisms of these face adaptation effects (FAEs) have been considered to be based on sensory adaptation processes. However, by employing famous faces, recent studies were able to demonstrate that FAEs are very reliable and robust over long periods of time. This suggests a high level processing and an adaptation on a rather representational memory basis. Although research on FAEs seems to be well-advanced, our knowledge is still quite limited in terms of which qualities of a face can be adapted, as most studies have focused only on configural information (i.e., mostly 2nd-order relations). By employing brightness alterations, we investigated whether non-configural face information also play a significant role in the processing and storage of faces. Our results provide clear evidence for robust non-configural color adaptation effects which seem to be very unique within the context of faces.

Map Reading for Navigation

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Map reading for navigation involves transformations of allocentric information into first-person-perspective actions. Participants (N = 42; n = 31 students, M = 21.97 years, SD = 2.85, 23 female; n = 11 senior students, M = 66.09 years, SD = 4.70, 6 female) read a map. A short route was indicated. A “you-are-here” dot indicated the start location and the initial viewing direction. This viewing direction was not aligned with the “up”-orientation of the map and it did not correspond to the direction of travel. Three out of nine decision points involved critical turning decisions. Two of them included landmarks. Eye tracking was applied during map reading. After reading, participants navigated the route in a virtual environment from memory. Navigation errors at decision points were recorded. Perspective taking (i.e., allocentric-egocentric transformations involving misalignment) ability was assessed.

Navigation errors reflected expected difficulties. Errors occurred at the first intersection where initial re-orientation was required. Errors were found at the critical intersection without a landmark but not at a comparable intersection with a landmark. Seniors spent generally less time than students fixating critical areas during reading. At the critical intersection without landmark, seniors made no error at all, in contrast to students. Student’s navigation errors were more strongly related to their perspective taking ability ($r = .72$, $p < .001$) than senior’s navigation errors ($r = .37$, ns). These results suggest that seniors might be more competent in map reading for navigation than students.

New methods to reduce social desirability bias in self-reports

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Social desirability bias is the most important threat to the validity of self-reports. This symposium presents the latest research investigating new approaches to improve the control of social desirability, and discusses experimental, methodological and simulation-based approaches to the fundamental research question of how the tendency to provide biased or dishonest self-reports can be addressed. Particular emphasis is placed on how the validity and efficiency of models and sampling designs used to determine the prevalence of sensitive attributes can be improved. The contributions include reports on recent advancements of the Randomized-Response-Technique including a new model for the detection of cheating and resource-saving sequential sampling designs, a proposal advancing the application of honesty contracts, and an investigation of overclaiming questionnaires (OCQs) as an alternative to Residualized Individual Change Scores (RICS).

An Auditory Measure for Temporal Binding

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Voluntary actions and causally linked sensory stimuli are perceived to be shifted towards each other in time. This so-called temporal binding is commonly assessed in paradigms using the Libet clock. In such experiments, participants have to estimate the timing of performed actions or ensuing sensory stimuli (usually tones) by means of a rotating clock hand presented on screen. The aforementioned task setup is however ill suited for many conceivable setups, especially when they involve visual effects. To address this shortcoming, the line of research presented here establishes an alternative measure for temporal binding by using a sequence of timed sounds. This method uses an auditory

timer, a sequence of letters presented during task execution, which serve as anchors for temporal judgements. In four experiments, we manipulated four design factors of this auditory timer, namely interval length, interval filling, sequence predictability, and sequence length, to determine the most effective and economic method for measuring temporal binding with an auditory timer. The auditory measure was in principal apt to measure both action as well as effect binding in all four experiments (N = 192). While interval length and sequence length had a particularly strong influence on temporal binding, interval filling and sequence predictability did not seem to be of utmost importance. Participants' task load gave additional information on the best configuration of an auditory timer.

Does foreign language alter moral judgments? Results from two pre-registered studies with the CNI-model

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Recent studies suggest that processing moral dilemmas in a foreign language instead of the native language increases the likelihood of moral judgments in line with the utilitarian principle. The goal of our research was to investigate the replicability and robustness of this moral foreign-language effect and to explore its underlying mechanisms by means of the CNI model—a multinomial model that allows to estimate the extent to which moral judgments are driven by people's sensitivity to consequences (C-parameter), their sensitivity to norms (N-parameter), and their general preference for action or inaction (I-parameter). In two pre-registered studies, German participants provided moral judgments to dilemmas that were either presented in German or English. In Experiment 1, participants judged eight different dilemmas in four versions each (i.e. 32 dilemmas in total). In Experiment 2, participants judged four different dilemmas in only one of the four versions (i.e. 4 dilemmas in total). Neither of the two studies replicated the moral foreign-language effect. Moreover, we also did not find language effects on the three parameters of the CNI-model. We conclude that if there is a moral foreign-language effect at all, it has to be very fragile and context-specific.

Super-Recognizers: Psychophysical Examination of Individual Differences

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So-called “super-recognizers” possess exceptional facial identity processing ability. Despite broad agreement about their superior ability, consensus is lacking on the proper means for assessing their specific skills. Previous studies have relied on simple performance measures across heterogeneously related subprocesses. Unfortunately, this approach skirts contributions of stimulus information to face processing, consequently failing to distinguish qualitative and quantitative differences between super-recognizers and the general population.

Here, we sought to probe individual differences among super-recognizers (N=11) identified using a novel, conservative diagnostic framework (Ramon, under revision) and controls (N=31). To that end, we systematically varied retinal availability (Sowden & Schyns, 2006), bandwidth, and orientation (Pachai et al., 2017) of spatial frequency content in face stimuli over two experiments.

We found no evidence of preferential exploitation of horizontal or vertical spatial frequency information content among super-recognizers relative to controls. Super-recognizers did, however, more consistently exploit a wide band of retinally available spatial frequency information shared commonly with controls. Overall, our findings further stress the importance of optimizing procedures for super-recognizer diagnosis by including intra-individual consistency assessments.

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Between- and Within-Subject Covariance Perspectives Matter for Investigations into the Relationship Between Single- and Multi-Tasking Performance

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Multitasking paradigms, wherein individuals execute tasks concurrently, are an established tool for elucidating how tasks are represented and controlled. Often, the response time variables of interest are averaged across participants and compared across single- vs. dual-tasking blocks. Here we propose that it is of theoretical as well as of practical relevance to obtain and use both within- and between-person variability in average reaction time to predict dual tasking performance. Psychological processes should show up as dynamics within the individual (rather than between-person differences) and can be captured by fluctuations across sessions. Flexible working arrangements might allow to allocate demanding multitasking to good rather than bad days – if there indeed is systematic fluctuation leading to good vs. bad multitasking days. To explore this perspective, we had 58 participants perform two simple tasks, first as single tasks and then as concurrently presented tasks, over the course of twenty sessions. We found that there was a positive relationship between both single and dual-tasking performance and between both component tasks in the dual-tasking condition both on a within-person as well as a between-person level. Better single-taskers turned out to be better dual-taskers and sessions with better single-tasking performance also yielded better dual-tasking performance. We conclude that there are shared capacities for dual- and single-tasking that vary between people and fluctuate together between sessions and that the examination of multitasking from within- and between-person perspectives is a promising perspective for future research.

Attentional Templates in Crossmodal Search: Neural Correlates of Distributed Attention and Target Similarity

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Our attention resource is limited and influenced by the representations of targets, known as attentional templates. Yet, it is still controversial at which level of functional architecture of the attentional guidance that attentional templates are built in searching multiple targets. We hypothesized that target similarity plays a critical role on what attentional templates should be used. In a detection task, observers had to respond to targets among visual distractors. Importantly, at each block targets came from a set of two possible items. Critically, we manipulated the target sets similarity

across different blocks: 1) square + triangle (i.e., within the same dimension), 2) square and color (i.e., across dimensions), 3) square and tactile vibration (i.e., across modalities).

We found the search performance was fastest when the target set shared the same dimension, slower when targets differed across dimensions, and slowest for targets across modalities. In addition to the behavioral findings, the recorded EEG also confirmed distributed activations over frontal and parietal regions in early ERPs (e.g. N1, P2, N2) and attentional lateralizations, reflecting the behavioral performance. These findings confirm that attentional templates were built based on the target similarity in the functional hierarchy of information processing.

Idiosyncratic encoding influences on metamemory judgments

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Metamemory refers to the cognitive processes that enable people to reflect and know about their own memories. When making judgments of learning (JOLs), people predict how likely it is that they will remember studied words on a future test. Several cues underlying JOLs have attracted much of attention, but no research has addressed the role of idiosyncratic cues due to difficulties with experimental control. In this study, we manipulated the personal relevance of words by asking participants to write a story including 10 synonyms of to-be-studied words. A total of N=50 University Mannheim undergraduates wrote a story, then studied words making JOLs, followed by a free recall test. JOLs and recall were higher for story words synonyms than for remaining words. Analyzing both JOLs and recall performance with Brunswik's lens model resulted in a reduction of the 'non-linear' C parameter when a dummy variable coding words as story synonyms vs. neutral words was included into the model, thus, explaining systematic variance. These findings indicate the importance of idiosyncratic encoding as a cue for metamemory judgments. In addition, this highlights that the lens model is a promising tool for researchers to assess idiosyncratic encoding strategies that otherwise cannot be investigated and contributes to our understanding of the accuracy and basis of metamemory.

The information focus influences gender bias on hiring decisions

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Previous studies showed that gender stereotypes influence objective cues. For example, Dorrough et al. (2017) gave participants decision matrices in which male and female experts (cues) recommended products. The product categories were associated with a gender (e.g. hand crème). Therefore, the experts either matched or did not match the associated gender. Results showed that participants treated the cues differently depending on the match or mismatch of the associated product gender and the gender of the expert. In our experiments, we modified the design such that the cues were gender-neutral, whereas the options were gendered. For example, participants decided between a female and a male job candidate for a job associated with either gender (e.g. engineer or nurse). Thus, a stereotype bias could both cause participants to favor one of the genders in general, as well as to favor applicants if the job category matched the gender. When we instructed participants only to rely on the cues in the decision matrix the Bayes factors showed substantial evidence against any use of gender information. However, when this instruction was missing gender information biased decision-making. Thus, stereotypes can be influenced and corrected voluntarily.

Bayesian Analysis of Processed Information in Decision Making Experiments

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In research on decision making it is often informative to know which information is used by a participant in making decisions. Current methods often rely on secondary measures, such as eye- or mouse-tracking, which can only indicate which information was perceived and not if that information was used or ignored. Similarly, analyzing the decision patterns often requires detailed assumption about how the information is used. We propose an analysis method, which allows to analyze which information is used during decision making without making any assumptions on how this information is used. This allows us to calculate Bayes factors indicating how likely that information was used by a participant. This method only requires users to define simple hypotheses corresponding to possible patterns of information usage. In a simulation study, we demonstrate the high reliability of this method (area under ROC curve > .92) and we give an example how this method may be used to analyze data from an experiment.

Does the P3b as a marker of conscious awareness require multisensory integration?

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A central question in consciousness science is to determine which cortical marker predict conscious awareness. Inspired by the view that conscious awareness relies on activity in Global Neuronal Workspace conceptualised as a distributed frontoparietal network, the P3b has been heralded a neural marker of conscious awareness. Predictive coding is a dominant view in neuroscience stating that perceptual systems are hierarchically organised and that neural information flow between these levels reflect a prediction error resulting from a compromise between predictions of sensory inputs and actual incoming sensory information. Based on this view, the P3b might be a supramodal cortical signature of prediction error propagation between higher-order levels of the cortical hierarchy which combines converging sensory information from the levels below. We tested this hypothesis using a temporal generalisation analysis contrasting lower-order and higher-order cortical markers of expectation violation obtained using a hierarchical oddball paradigm in different sensory modalities. An analysis of the temporal dynamics of the P3b showed that cortical activity supporting the P3b is maintained in a late time window regardless of which sensory modality stimuli composing the oddball were sampled from. We also show that cortical activity associated with the P3b is shared between different sensory modalities. These findings provide evidence for the claim that the P3b is a supramodal marker of higher-order prediction violation which operates on converged inputs from different senses. Converging a Global Neuronal Workspace and Predictive Coding view of the P3b, our results raise the possibility that conscious awareness might require multisensory integration.

Memory for “true” and “false” feedback and a priori beliefs: An investigation from the perspective of dual-recollection theory

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For over twenty years now in experimental psychology, the mechanisms underlying memory for truth and falsity have been researched and debated. Psychologists have often referred to the Spinozan and Cartesian models about truth-value information “tagging” but, so far, experimental results have been inconsistent. This paper investigates memory for truth and falsity from the new perspective of the dual-recollection theory. We conducted two experiments using the conjoint recognition paradigm and multinomial modelling as a measurement model. Both our experiments confirmed a satisfactory goodness of fit of the data to the dual-recollection multinomial model. The results indicated that processes contributing to memory performance for trivia statements differ depending on their truth-value. In Experiment 1, the context recollection parameter representing memory for feedback information was significantly higher for true than for false statements. This finding was replicated in the second experiment, which controlled the potential impact of participants’ previous knowledge on memory performance. Experiment 2 indicated that the target recollection parameter representing memory for the sentence itself was significantly higher for true than for false sentences solely when participants believed this sentence to be true but not when they perceived it as false before the memory experiment. Our research was the first attempt to look at memory for truth and falsity from the perspective of the recently developed dual-recollection theory. The distinction between conscious reinstatement of contextual details (feedback information) and conscious reinstatement of target events per se (sentences) opens a new approach to disentangle the processes underlying memory for truth and falsity.

The effects of levels-of-processing and stimulus type on the rejection of perceptually vs. semantically dissimilar distractors: An analysis using the two-high threshold model of recognition memory

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In two experiments we studied the encoding orientation effects on false memory for the lures that matched or mismatched the perceptual or the semantic features with the target stimuli. We built our predictions on the literature concerning the recall-to-reject and the retrieval monitoring processes (e.g., Chan et al., 2005; Gallo, 2004; Gallo et al., 2008; Jacoby et al., 2005; Rugg & Wilding, 2000). The recall-to-reject process involves the recollection of information about studied items that disqualifies inconsistent test probes. Monitoring for specific features during retrieval may be enhanced by an encoding orientation that is recapitulated during retrieval. As materials we used concrete words (Experiment 1) or door scenes (Experiment 2), and manipulated the level of processing at study and the type of distractors presented at test. We used the two high-threshold multinomial processing tree model of recognition memory as a measurement model (Kellen et al., 2015). Our results clearly supported the effects of retrieval orientation on disqualifying monitoring for both words and pictures. The participants successfully detected as new the lures that mismatched the category with the target words and, in mirror symmetry, they successfully detected as new the lures that mismatched the colour with the target pictures. Moreover, we found these interaction effects on false memories when significant levels-of-processing effects on accurate memories were observed as well as when such effects were not present. The results indicate that retrieval monitoring mechanisms depend on the interaction between encoding orientation, study materials, and differentiating features of distractors.

Episodic memory depends on predictable sequential shifts

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Our cognitive system uses sequential regularities to predict future events. These predictions (priors) are contrasted with incoming sensory evidence. In case of a mismatch (prediction error, PE), events are remembered less. We investigated the impact of sequential category shifts and inter-stimulus distance on PE-induced modulations of episodic memories. Participants classified scenes or objects as indoor/outdoor. Some stimuli were arranged in a partly repeating sequential triplet structure. Triplets were presented twice, with the third stimuli being replaced by a new one at the second presentation. A surprise recognition test followed. We hypothesized that participants would recognize the beginning of the triplets at the second presentation and predict the third item. The absence of the predicted item should lead to a PE and thus to worse recognition of the initially memorized item. Importantly, we manipulated category transitions from the second to the third item of the triplet (same category or different categories), hence, there were perceptual repetitions or perceptual shifts e.g., from objects to scenes (or vice versa). We also varied the number of stimuli presented between the two occurrences of the triplets, with the hypothesis that shorter distance should lead to stronger PE, hence further worsening the memory of the third item. Recognition memory decreased more for perceptual shifts than for perceptual repetitions when the inter-stimulus distance was short. The opposite pattern was observed when the inter-stimulus distance was long. We conclude that PE was intensified by category repetition, but only when the triplets were presented relatively close to each other.

Do salient object groupings in the neglected visual field capture attention?

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The integration of fragmentary parts into coherent whole objects has either been suggested to rely on the availability of attentional resources, or, it may arise automatically, that is, from pre-attentive processing (prior to the engagement of selective attention). In the present study, these two potential accounts were tested in a group of neglect patients with right-sided parietal brain damage and associated deficits of selective attention in the left hemispace. The reported experiment employed a search task that required detection of targets in the left and right hemifield, which were embedded in configurations that consisted of variants of Kanizsa figures. Our results showed that a salient, grouped Kanizsa triangle presented in the unattended, left hemifield can substantially improve contralesional target detection performance, but the very same triangle configuration does not facilitate target detection in the impaired hemispace when presented together with an ipsilesional, yet non-salient target. This shows that attention is only captured by the grouped object in the impaired hemispace when attention is not needed elsewhere, i.e. in the attended hemispace. This demonstrates that both object integration and the guidance by salient, integrated objects crucially require attentional resources.

The Influence of Basic Cognition on Economic Behavior

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Regularities in economic behavior are generally considered to be reflective of people's underlying preferences. However, there is a growing body of literature that re-evaluates how much of this behavior is actually reflective of preferences and how much is dependent on more basic psychological processes such as cognition or number perception. More specifically, economic decisions have been found to be affected by processes such as numerical cognition, option complexity, memory capacity or selective attention. Taking these factors into account can provide a better understanding of how people make economic judgments and decisions. In this symposium, recent advances on the influence of basic cognitive processes on economic behavior will be presented and discussed.

Alice Mason will present work on the relationship between memory and risky choice, attempting to disentangle the degree to which people recall individual instances or sample from a distribution in memory to inform their decisions under risk in a decision from experience paradigm.

The talk by Yvonne Oberholzer will focus on the influence of option complexity (i.e. number of outcomes) on risk preferences in judgments and choices in decisions from description and the dependency of this relationship on individual cognitive ability.

Sebastian Olschewski will talk about participant-selected-sampling in an estimation task and discuss the cognitive limits of sequential information integration and whether risk taking is adaptive to the actual uncertainty people face.

The talk by Ioannis Evangelidis will focus on novel theoretical explanations for systematic contextual influences on purchasing decisions by contrasting the influence of context in judgment (willingness to pay) and choice.

Finally, Konstantinos Tsetos will present work on how selective psychological attention processes can explain violations of rational choice theory in an economic context.

Complexity Aversion in Risky Judgments and Choice

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In the age of digitalization and globalization, our decision environments have become increasingly complex. However, it remains unclear if and how complexity - defined as the number of outcomes - alters risk preferences. Previous research investigating this relationship revealed somewhat conflicting results, with some researchers finding complexity aversion and others finding complexity neutrality. We address these conflicting results by investigating the effect of complexity on risk preferences in two studies (overall $n = 391$). Our results reveal that complexity aversion seems to be format dependent (stronger effect in choices than valuations) and most likely stems from an avoidance of cognitive effort. In support of this, cognitive ability was an important moderator of the effect and a process measure of participant cognitive effort correlated negatively with the effect. Additionally, our results revealed that complexity increases the noise in the decision process, a mechanism that could potentially amplify the effect in asymmetric choice designs. These results have important implications for experiment designs in risky choice and judgment and can inform cognitive models and the comparative study of groups differing in cognitive ability (e.g. age effects).

Fahrzeugautomatisierung als Garant für die Erhöhung der Sicherheit im Straßenverkehr?

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Die zunehmende Automatisierung der Fahrzeuge sowie die steigende Vernetzung im Straßenverkehr eröffnen große Chancen für die Verkehrssicherheit, aber auch viele Herausforderungen an die Fahrer sowie an die Gestalter von Fahrzeugen und Verkehrsräumen. Moderne Fahrerassistenzsysteme sollen den Risikofaktor „Mensch“ am Unfallgeschehen minimieren. Gelingt dies auch bei zukünftigen Fahrzeugen im hoch- oder vollautomatisierten Betrieb, könnte die zunehmende Automatisierung einen erheblichen Beitrag zur Verkehrssicherheit leisten. Andererseits stellt sich bei Interaktionen mit Fahrzeugen im hoch- oder vollautomatisierten Betrieb die ganzheitliche Frage nach den Sicherheitsansprüchen und dem Sicherheitsempfinden der gesamten Verkehrsteilnehmer im Verkehrsraum. Die derzeitige Technikentwicklung hat sowohl den Fahrer (als Nutzer und Überwacher der Automatisierung), alle anderen Verkehrsteilnehmer (als Nutzer des gemeinsamen Verkehrsraumes) als auch die Gesetzgebung weit hinter sich gelassen. Dennoch gilt der Anspruch, dass die Automatisierungstechnik in den Fahrzeugen sicher zu sein hat, als gesetzt. Eine objektiv-wissenschaftliche Untermauerung des Anspruches steht allerdings aus. Gerade auch Verkehrsteilnehmer formulieren einen Sicherheitsanspruch an Fahrzeuge im hoch- oder vollautomatisierten Betrieb, ob als Fußgänger, selbststeuernder Fahrer oder überwachender Fahrer eines Fahrzeugs im hoch- oder vollautomatisierten Betrieb. In den Vorträgen des Symposiums „Fahrzeugautomatisierung als Garant für die Erhöhung der Sicherheit im Straßenverkehr?“ wird der Fokus besonders auf den verkehrspsychologischen Determinanten einer sicheren Interaktion zwischen Verkehrsteilnehmern und Fahrzeugen im hoch- oder vollautomatisierten Betrieb liegen. In fünf ausführlichen Vorträgen werden dazu empirische, experimentalpsychologische Befunde vorgestellt, die jeweils kurz diskutiert werden. In der abschließenden Gesamtdiskussion im Plenum wird die Bandbreite der Gestaltungs- und Evaluierungsmöglichkeiten einer sicheren Verkehrsraumnutzung durch Fahrzeugautomatisierung auf Grundlage der neuen empirischen Befunde eröffnet.

Es sind fünf Vorträge inklusive Diskussionen sowie eine abschließenden Gesamtdiskussion im Plenum geplant:

Sicherheit auf den ersten Blick? Einfluss externaler Mensch-Maschine-Schnittstellen hochautomatisierter Fahrzeuge auf Fußgänger (Marc Wilbrink, DLR)

Gewöhnen wir uns an fahrerlose Pkw? Evaluation von externen Mensch-Maschine-Schnittstellen mittels Messwiederholungen im kontrollierten Feld (Philip Joisten, TU Darmstadt)

„Hey automatisiertes Fahrzeug: park mich sicher und komfortabel ein ohne andere zu irritieren.“ Weglückenakzeptanz als Basis menschenzentrierter automatisierter Fahrstile. (Matthias Beggiato, TU Chemnitz)

Reaktion menschlicher Fahrer auf hochautomatisierte Fahrzeuge im Mischverkehr (Vanessa Stange, TU Braunschweig)

Eingriffsassistenten für Übernahmen in kritischen Ausweichsituationen beim automatisierten Fahren (Stefan Brandenburg, TU Berlin)

Abschließende Gesamtdiskussion im Plenum

Working memory - a unified concept across modalities?

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Working memory is the cognitive faculty for temporary storage and manipulation of information. Traditionally, working memory research has focused largely on verbal and visual information. In the meantime, evidence for working memory in other modalities is growing and the question arises whether and to which extent properties that had been assigned to visual and verbal working memory transfer to other senses. In this symposium we bring together experts, who present findings from different sensory modalities (vision, audition, somatosensation, gustation), who use different methodological approaches (behavior, M/EEG, fMRI), and who take different theoretical stances.

Cora Fischer will address the mechanisms of serial dependence - how memory traces of past stimuli affect stimulus representations in working memory.

Daniel Schneider will explore attentional control processes of the reactivation in visual working memory after interruptions (secondary tasks) and associated deterioration of working memory performance.

Yuri Pavlov will show how EEG (posterior alpha, frontal theta, and P300) and pupil size respond to the increasing auditory working memory load up to the levels far exceeding normal capacity limits

Timo Schmidt will present data on the maintenance of abstract quantity information (e.g. estimated numerosity) and mechanisms of tactile rehearsal.

Kathrin Ohla will present evidence for a gustatory (taste) working memory with limited capacity most consistent with a slot-like organization rather than the notion of a flexible pool of resources.

Thomas Christophel will round the symposium and present new vistas on visual working memory by looking at the different ways color is represented neurally during working memory.

The Capacity and Organization of Gustatory Working Memory

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Remembering taste is crucial in food intake and associative learning. We investigated whether taste can be dynamically encoded, maintained, and retrieved on short time-scales consistent with working memory (WM). We used two novel single and multi-item taste recognition tasks to investigate the organisation and limit of gustatory WM. In experiment 1, we show that single tastes can be reliably recalled despite multiple oro-sensory disturbances suggesting an active and resilient maintenance. When multiple tastes were presented, the resolution with which tastes were maintained, depended on their serial position highlighting a role of attention. Participants reliably recalled up to three tastes, which we propose is the limit of gustatory WM. Lastly, recall was better for match than lure trials likely due to increased stimulus similarity in foil trials. Together, our results advocate a hybrid model of gustatory WM with a limited number of slots where items are stored with varying amounts of precision.

Risk aversion: Economic preference or a perceptual bias?

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The processing of sequentially presented numerical information is a prerequisite for decisions from experience, where people make choices between gambles after learning about potential outcomes and their associated probabilities. However, little is known about what makes people like or dislike individual gambles and how number processing affects this preference. In a series of experiments, participants repeatedly experienced samples from continuous outcome distributions and were incentivized to either submit an economic valuation or estimate its mean. We found that participants valued distributions below their means, high variance sequences lower than low variance sequences and left-skewed sequences lower than right-skewed sequences. Similar though less pronounced patterns also occurred in the mean estimation task, where preferences should not play a role. These results are not consistent with prior findings in decision from experience such as overweighting of high numbers and underweighting of rare events. Rather, the qualitative effects as well as the similarity of effects in valuation and estimation are consistent with assuming that people process numbers on a compressed mental number line in valuations from experience.

Immediate versus delayed resolution of tax audits: An investigation of decision outcomes and cognitive processes

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People generally exhibit a preference for early resolution of uncertainties in risky decisions, especially when losses are at stake. In a related sense, when facing decisions to pay taxes in the lab, individuals more often choose the sure option (i.e., full tax compliance) when feedback about tax audits is delayed rather than immediate. We ran two separate experiments (N = 206 & N = 212) to test whether this effect replicates under varying tax system characteristics and which underlying cognitive processes might be driving the effect. We find consistent evidence for higher tax compliance when audit feedback is delayed and the effect is stable across varying tax system characteristics. To investigate the underlying cognitive processes, we used MouselabWEB in the second Experiment – a tool that monitors mouse courses movements in a hidden information display matrix providing data on the frequency, order, and duration of information acquisitions. The results suggest that the observed effect is mainly driven by increased choice conflict among individuals who face delayed resolution of audit uncertainty, qualified by longer decision times and overweighting of deterrence information.

Drawing as an encoding tool to enhance item and associative memory: distinctive benefits in younger and older adults

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Episodic memory decline is disproportionately large in healthy ageing. It is mainly based on difficulties to create and remember associations, but also on difficulties to spontaneously use appropriate strategies. A well-known encoding strategy to enhance associative memory also in older adults is to create mental images relating the single items of an association. Recent studies showed a beneficial effect of such imagery processes involved in drawing during encoding on memory for single items - in younger and older adults. To date, no study investigated if drawing also enhances associative memory. We thus aimed to investigate if drawing during encoding enhances associative memory and if there

were distinctive effects in younger and older adults. We tested 29 younger and 29 older healthy adults in a recognition memory task with word-pairs. The paradigm allowed to distinguish between item memory and associative memory. We further manipulated the encoding tool (within participants): in the drawing condition, participants had to draw an image integrating both words of each pair. In the writing condition, participants had to repeatedly write the words of each pair. Results revealed that younger adults benefitted from drawing during encoding in item and associative memory. However, older adults tendentially benefitted in item, but not in associative memory. We thus extended previous findings showing benefits of drawing on item memory to associative memory in younger adults. Further investigating the distinctive impact of drawing on associative memory between age groups will provide important insight on underlying mechanisms involved in encoding strategy-use of older adults.

Response-Related Crosstalk in Dual-Tasking and Its Modulation by Age

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Difficulties in performing two tasks at once arise from several sources and usually increase in advanced age. Herein, crosstalk between conflicting response codes is a relevant source of interference. We investigated intra-modal response-related crosstalk and their age-related differences, implementing a spatial auditory-manual dual-response paradigm that allowed us to independently assess the impact of stimulus–response (S-R) compatibility and response–response (R-R) congruency. We tested the reproducibility of the effects in the MR scanner (exp. 2). Participants (20 young and 21 older adults in exp. 1; 43 young and 36 older adults in exp. 2) were instructed to respond with spatially (in-)compatible key presses to high- or low-pitched tones with one or both hands (single- vs. dual-task condition).

In both experiments, dual-task performance costs were unaffected by S-R compatibility but increased with R-R incongruency, which was further enhanced with age. Crucially, S-R compatibility and R-R congruency significantly interacted revealing a reversed effect that holds across age: In R-R incongruent response compounds, costs were much more exacerbated for S-R compatible than incompatible responses. The reproducibility of the effects inside the scanner speaks for the robustness and stability of this paradigm.

Taken together, the asymmetric cost allocation under response-code conflict corroborates a strategic prioritization of limited processing capacity based on mapping selection difficulty. The increase of crosstalk in older adults indicates particular age-related deficits in multiple-action control at the level of task rule shielding and increased susceptibility to response-code confusability. Our results support a dual-task model of flexible capacity sharing without fully separate processing streams.

How information integration costs shape strategy selection in decision making: A Bayesian multimethod approach

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Decision makers have at their disposal both compensatory strategies, which integrate across all available attributes of an option, and noncompensatory strategies, which consider only part of the attributes. Compensatory and noncompensatory strategies make different predictions both for the resulting decisions and patterns in response time. I present a Bayesian latent mixture approach that seamlessly combines decision and response-time data to infer a person's strategy use. The approach

also allows to compare different assumptions about the information processing in compensatory strategies (e.g., regarding how the amount of available evidence influences response error and response times), taking into account the model complexity inherent in the assumptions. I apply the approach to examine the influence of the cognitive costs of integrating attribute information on strategy selection in decision from givens (where all attribute information is openly provided). Participants were asked to decide between two alternatives and both the number of attributes shown for each alternative and how attribute information was coded were manipulated. The results show that participants predominantly selected a noncompensatory strategy when the number of attributes was high and the attribute coding scheme varied across attributes; otherwise, they mainly relied on a compensatory strategy. I suggest that the pattern of strategy selection reflects an adaptive response to the costs of information integration, a previously neglected factor for strategy selection. The findings suggest an explanation for a puzzling inconsistency in previous studies on strategy selection in decision from givens; they also reveal boundary conditions of automatic compensatory processing in decision making.

What is causing “inhibition of return” in spatial cueing tasks? Temporally disentangling multiple cue-triggered effects on multiple time scales using response history and conditional accuracy analyses

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Uninformative cues often facilitate mean response time (RT) performance in valid compared to invalid cueing conditions at short cue-target SOAs, and robustly generate a reversed or inhibitory cueing effect at longer SOAs that is widely known as inhibition-of-return (IOR). To study the within-trial time course of IOR we employ discrete-time hazard and conditional accuracy analyses to describe and model the shapes of the RT and accuracy distributions measured in two experimental tasks. In contrast to the mean performance measures, our distributional analyses show that (a) the uninformative cue generates response channel activation, (b) which continues during the cue-target interval so that the cue location must be stored in spatial working memory, (c) the premature cue-triggered response is selectively inhibited before target onset, (d) the IOR effect (valid versus invalid cueing) emerges around 160 ms after target onset in the hazard functions when cue-target SOA exceeds ~200 ms, quickly increases and decreases in size, and is gone within 120 ms, (e) the inhibitory component does not diminish over the course of the experiment, and (f) the location of an additional central cue relative to the current focus of spatial attention can generate response channel activation as well. These distributional data show that mean performance patterns conceal crucial information about behavioral dynamics, and suggest that sensory IOR is the direct result of encoding the cue location in spatial working memory to promote change detection, instead of attention leaving an inhibitory tag to promote visual search.

A software presentation of the R package anticlust

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Anticlusting is the lesser known twin of classical cluster analysis and is used to partition data sets into subgroups in such a way that the subgroups are as similar as possible. anticlust is an open source R package (available from <https://github.com/m-Py/anticlust>) that implements the anticlusting methodology. Partitioning data sets into similar groups is frequently required by researchers in experimental psychology when designing a study. For example, conditions in within-subject design are often accompanied by different, but comparable sets of stimuli. While creating such sets of stimuli is time-consuming and daunting when done manually by the researcher, the anticlust package performs this task within fractions of a second and with strongly improved results. anticlust implements various objective functions to assess similarity of stimulus sets and several algorithms to optimize similarity according to these criteria. It handles categorical as well as numeric data and the standardization of input variables. Using real norming data of experimental stimuli, the presentation shows how to handle anticlust in the R environment and how researchers can adjust its various parameters to optimally exploit its capabilities in their own research routine.

Do Group Ensemble Statistics Bias Visual Working Memory for Individual Items? A Registered Replication of Brady & Alvarez (2011)

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Previous findings suggest that memory representations of individual objects are influenced by summary statistics such as the mean size or the mean location of retained objects. We performed a registered and precise replication of one of the experiments reporting such effects, namely Experiment 1 reported in Brady and Alvarez (Psychological Science, 22, 384–392, 2011). The original experiment found that participants, who were asked to memorize the size of differently colored circles, reported the size of a probed circle biased toward the mean size of the same-colored group. We powered the present registered replication using a Bayes Factor Design Analysis such that it provided compelling evidence regarding the presence or absence of the reported bias with a high probability, even under the assumption of smaller effect sizes. Thus, we recruited 663 participants through Amazon Mechanical Turk. We observed both a significant bias and strong Bayesian evidence in favor of the existence of a bias over the null hypothesis. Thus, our results can be considered a successful replication of the original findings, however, with a considerably smaller effect size. We also discuss the role of data quality when recruiting participants with Amazon Mechanical Turk.

Episodic Retrieval of Erroneous Responses

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In this study (n=62), we investigated processes of stimulus-response binding and retrieval (SRBR) for erroneous responses. In a sequential prime-probe design, a colour categorisation task was used to measure SRBR for errors that occurred under time pressure. An orthogonal variation of colour relation (colour repetition vs. change) and distractor relation (word repetition vs. change) allowed the study of retrieval effects as a function of distractor repetitions. Three colours were mapped to three response keys, which allowed three different response sequences after a prime error: (A) repetition of the erroneous prime response in the probe, (B) repetition of the response that would have been the

correct response in the prime, (C) new response matching neither the erroneous nor the correct prime response. This allowed us to distinguish between different accounts of what is retrieved by distractor repetitions after erroneous prime responses: (1) Motor-based retrieval (of the actual erroneous response), (2) Rule-based retrieval (of the correct but not executed prime response), (3) Outcome-based retrieval (no retrieval following an erroneous prime response), or (4) Simultaneous retrieval (of Motor-based and Rule-based responses). The latter option would result in null effects for A and B, since facilitation and interference would cancel each other out in these conditions, and by performance costs for C where both retrieval processes are incompatible with the required prime response. Our findings support the Simultaneous retrieval account, implying that both, the actual error and also the correct response are retrieved after errors.

Work in progress: Do we speak the same language? Communication between vehicle and driver. Expert perspective on interface design – a qualitative study

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One of the most important issues regarding the development of automated vehicles is the communication between the driver and the vehicle. Since drivers must be ready to take control over the vehicle at all times, it is crucial that the Human Machine Interface (HMI) is designed to communicate with the drivers and to facilitate their action. A central issue in developing HMI solutions for automated vehicles is the resilient and safe collaboration between driver and vehicle. Many recent studies have focused on testing different HMI solutions from the drivers' perspective. However, few studies have been conducted on the design of a resilient HMI from an expert's perspective. The purpose of our investigation is to examine the requirements of an HMI and, in particular, how the interaction between the driver and the vehicle should be designed in concrete terms.

To this end, a set of semi-structured interviews will be conducted with experts from the automotive industry. We expect to get a deeper insight into the ways of creating HMIs that can ensure beneficial cooperation between the driver and the vehicle and thus lead to enhanced driving safety. Moreover, we aim to collect a dataset of useful references from the experts which can be used for the future HMI design process.

Watching the Brain as it Binds: Beta Synchronization Relates to Distractor-Response Binding

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Human action control relies on event files, i.e., short-term stimulus-response bindings that result from the integration of perception and action. The present electroencephalography (EEG) study examined oscillatory brain activities related to the integration and disintegration of event files in the distractor-response binding (DRB) task, which relies on a sequential prime-probe structure with orthogonal variation of distractor and response relations between prime and probe. Behavioral results indicated a DRB effect in reaction times, which was moderated by the duration of the response-stimulus interval (RSI) between prime response and probe stimulus onset. Indeed, a DRB effect was observed for a short RSI of 500 ms but not for a longer RSI of 2000 ms, indicating disintegration of event files over time. EEG results revealed a positive correlation between individual DRB in the RSI-2000 condition and postmovement beta synchronization after both prime and probe responses. Beamformer analysis

localized this correlation effect to the middle occipital gyrus, which also showed highest coherency with precentral and inferior parietal brain regions. Together, these findings suggest that post-movement beta synchronization is a marker of event-file disintegration, with the left middle occipital gyrus being a hub region for stimulus-response bindings in the visual DRB task.

EEG and pupillometry indices of auditory working memory overload

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In 1974, Peavler published a paper declaring that pupil dilation in a digit span task reaching asymptote at 7 items load even in the task of memorizing 13 digits – far exceeding normal working memory capacity limits load. Twenty years later, Granholm et al. (1996) attempted to replicate this finding but came to a different conclusion: the requirement to memorize a sequence of 13 digits (cognitive overload) evoked a drop in the pupil size returning it to the baseline level. Here, in a parallel EEG and pupillometry recording, we aimed (1) to replicate both studies in a larger sample and larger number of trials, (2) assess the effect of cognitive overload on electrophysiological indices such as P300, posterior alpha and frontal theta spectral power. Sixty participants were presented with a digit span task with auditory serial presentation of the digits. Sequences of five, nine or 13 digits with SOA of 2 second corresponded to three levels of working memory load. Consistent with the results by Granholm et al., in the 13-digits condition pupil size started declining after presentation of the ninth digit and dropped to the baseline level before the instruction to recall the sequence. In contrast, similar to Peavler's results, although obtained in a different domain, the EEG indices reached asymptote after 7 items load. Our results indicate a disassociation between the EEG and pupillometry indexes of cognitive overload.

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Content-dependent separation of the task streams foster within-task prediction in dual-tasking

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In dual-tasking, a common finding is that implicit learning is reduced whenever the second task is randomly presented. Implicit learning only takes place if integration is possible. This might indicate that participants represent the tasks as one single task set, instead of two separate tasks. The current study aimed at testing whether distinguishable action effects can alter this integrated task representation by supporting a content-dependent separation by fostering predictions within-task. For this purpose, we used a serial reaction time task (SRTT) together with an auditory tone task. Participants had to respond to the location of air bubbles presented at one of four lily pad positions on the screen. Concurrently, either a bird or a bumblebee appeared on the screen. Participants task was to press the key assigned to the respective location and to decide whether the animal was a bumblebee or bird. In the effect condition (n=24), a response to the SRTT target produced a frog jumping on the indicated lily pad, while in the animal task a response produced the sound of the respective animal. In the control condition (n=24), no effects were presented, but instead an error feedback for both tasks appeared at the end of each trial. In both conditions, participants completed six dual-task training blocks and three single-task test blocks (SRTT only). Implicit learning was found in the effect but not in the control condition. Overall the current finding suggest that action effects seem to contribute to an increased separation of task representations in dual-tasking.

An Investigation of the Attentional Blink using TVA

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The Attentional Blink (AB) refers to a deficit reporting a second target (T2) imbedded in a stream of distractors when presented 200-500 ms after a preceding target (T1). Several theories about the origin of the AB have been proposed. Some theories claim that the AB is the result of a temporarily closing of an attentional gate to avoid featural confusion for targets and distractors (filter-based theories), others that it is caused by a reduction in the capacity to encode or maintain visual information in working memory (bottleneck theories). In this talk, I will present the results of three experiments in which we systematically vary the exposure duration and composition of the T2 display allowing us to decompose the T2 deficit in terms of well-established parameters based on a Theory of Visual Attention (TVA). As the different AB theories make specific predictions in regard to which parameters should be affected during the AB, we are able to test their plausibility. All three experiments consistently show a lower processing speed of T2 during the AB, supporting theories placing a bottleneck at the encoding stage. Less evidence is found supporting filter-based theories or theories placing a bottleneck in the maintenance stage.

Outcome Relevance Affects Monitoring: On anticipatory saccades towards relevant and irrelevant future action outcomes

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Monitoring our actions' outcomes is essential for adapting to changing environmental contingencies. When our actions predictably yield certain sensory outcomes, we form bi-directional action-outcome associations and subsequently select our actions based on desired outcomes. At the same time, we proactively start monitoring them even before they have occurred in preparation of later comparing actual and expected outcome. This is evident in anticipatory saccades towards the predicted future location of an action's outcome. Here, we assessed how the proactive monitoring of action outcomes was affected by outcome relevance. Participants' left/right key presses, after a short delay, predictably produced one of a large number of complex symbols on the left/right side of the screen. This outcome was irrelevant in one session and relevant in the other session, in which participants additionally judged whether a depicted symbol was equivalent to the preceding outcome. Replicating prior studies, we found that participants anticipatorily saccaded towards the location of their actions' future outcomes. Surprisingly, however, anticipatory saccades occurred less often, later, and were shorter when action outcomes were relevant rather than irrelevant. The reverse was observed for saccades occurring during outcome presentation. To assess outcomes for comparison, peripheral vision (i.e., anticipatory saccades in the rough direction of the future outcome) was insufficient. Thus, it appears that in settings in which anticipatory saccades do not allow for the necessary precision in attention allocation, monitoring processes reduce anticipatory shifts of attention in favour of a faster and more precise allocation of attention upon outcome presentation.

How durable are benefits of distraction?

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When memorization of subsequent items is interleaved with distractors that require processing (as in the complex span task), short-term memory of the targets is usually impaired. However, when target words are followed by distractors that are semantically related to them, target memory receives a boost compared to when the distractors and the targets share no obvious semantic relationship. This effect is attributed to interference by superposition of representations in working memory. Our study investigated long-term effects of interleaving the memoranda with semantically related to-be-processed distractors. In Experiment 1, we used a complex span task with distractors either from the same or from a different semantic category as the target. We tested memory for targets in immediate serial recall and then in delayed category-cued recall. Both immediate and delayed tests yielded better performance for targets when distractors were semantically related rather than unrelated. In Experiment 2, we substituted half of the immediate recall tests with an arithmetic task to examine whether the cued-recall results from Experiment 1 were due to a testing effect from the immediate recall test. We replicated our results from Experiment 1 demonstrating better short-term and long-term memory on semantically related trials also in the absence of an immediate recall test. Our results suggest that the benefit of semantic relatedness in complex span tasks is not exclusive to immediate memory tests but can be observed in delayed tests as well. Thus, this effect may be attributed to general memory processes and not to mechanisms specific to working memory.

Visuo-haptically guided grasping in cataract-treated children

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Skillful grasping movements can be performed towards objects sensed visually, haptically, or visuo-haptically. Typically, reliability of the available sensory information influences the performance, with the most cautious grasps performed in presence of solely haptic information, the most accurate and precise ones when visual and haptic information is integrated (i.e., when grasping with one hand objects held with the other), and a performance in-between when only visual information is available.

Would a person that had only very limited visual experience so far be able to successfully perform visually guided grasps and benefit from multisensory integration when grasping handheld objects? We investigated a sample of cataract-treated patients (i.e., born with dense bilateral cataracts, and surgically treated years after birth), and compared their grasping performance after cataract removal with that of an age-matched group of typically developing children.

While sighted controls behaved as expected ($VH > V > H$), cataract-treated patients showed the least efficient grasping behavior when only visual information was available, reflected inter alia by the longest grasp duration and largest maximum grip aperture among the three conditions. However, similar to controls, they performed best in the visuo-haptic condition (i.e. $VH > H > V$). The results suggest that early and prolonged visual deprivation harms the development of skillful visually guided grasping, but does not prevent the integration of visual and haptic sensory information.

The mirror in your mind: An eye-movement study of adults reading mirror-script

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Reading requires children to learn that the left-right orientation of letters is important (e.g., differentiate between “b” and “d”), for which they have to suppress the fundamental tendency of the visual system to treat two objects similarly regardless of their vertical orientation (e.g., recognizing a face in a mirror). Previous studies have shown that even in adults, letters are mentally mirrored during early stages of visual word recognition. We investigated whether this finding generalizes to the sentence level and whether it also affects lexical stages of the reading process. We recorded the eye-movements of adults while reading the Potsdam Sentence Corpus - in which each sentence has a target word which is manipulated for length and frequency - in two different mirror-conditions: In the vertical mirror-condition, letters were flipped around their vertical (left-right) axis, while in the horizontal condition they were flipped around their horizontal (up-down) axis. Results show a strong main effect of mirror-condition: Horizontally mirrored sentences were more difficult to read than vertically mirrored sentences. In addition, mirror- condition interacted with word length in gaze duration and total reading time: In both measures, word-length effects were stronger in the horizontal than in the vertical mirror-condition. Importantly, frequency effects did not interact with mirror- condition. Our results show that it is easier to read in vertically compared to horizontally mirrored text in line with the vertical symmetry hypothesis and that mirroring letters does mainly disrupt the early stages of visual word recognition while leaving later lexical processing relatively intact.

Repeating head fakes in basketball: Temporal aspects affect the congruency-sequence effect

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When a basketball player performs a head fake, responses to the pass direction are slower and more error-prone. However, previous studies showed that the size of this so-called head-fake effect can be influenced by the preceding trial, as signified by a congruency-sequence effect (CSE). The head-fake effect is smaller, when the head fake is repeated. In the present study, we examined if the CSE is affected by the inter-stimulus interval (ISI) and/or the response-stimulus interval (RSI). To this end, static images of a basketball player performing a pass either with or without a head fake were used. Participants were asked to respond to the pass direction by pressing a left or right key. In Experiment 1, the ISI (500 vs. 2000 vs. 5000 ms), in Experiment 2, the RSI (500 vs. 2000 vs. 5000 ms) was varied and reaction times (RT) and error rates (ER) were analyzed. The results for RT and ER showed no CSE, when the ISI was manipulated in Experiment 1. However, when the RSI was varied in Experiment 2, the CSE affected the ER across all RSI, but it was modulated for the RT in a way, that the CSE was present for the RSI 500, but not for the RSI 2000 and 5000. Hence, when the head fake is repeated, the size of the head-fake effect appears to depend on the temporal lag between the previous response and the upcoming head fake. Therefore, a head fake in basketball should not be repeated too quickly.

The interplay of phasic alertness and accessory stimulation in visual choice reaction

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Visual stimuli are responded to faster when they are accompanied by accessory auditory stimuli. This happens even though accessory stimuli provide no clues for the required response. Responses are also sped up when auditory stimuli precede rather than accompany the visual stimuli. This is thought to be due to phasic alertness, a short-lived facilitation of the brain's readiness for information processing. Here, we ask how phasic alertness and accessory stimulation work together. In two experiments, we investigated how auditory alerting modulates the impact of subsequent accessory stimuli on a visual choice reaction task. Results showed that accessory stimuli enhance performance in the absence of alerting stimuli, but reduce performance when alerting stimuli had been presented before. In this way, the present findings argue that the relationship between phasic alertness and accessory stimulation is more complex than previously assumed.

Event segmentation by context in the auditory modality

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A core characteristic of auditory stimuli is that they develop over time. Referring to the event segmentation theory (Zacks et al., 2007), we assume that the temporal extension of contextual sounds might be able to support the segmentation of perceptual and response features into event files. This means that the on- and offset of a sound might indicate the start and end of an episode. As a consequence, perceptual features and responses appearing within a common auditory context should be bound more strongly than those appearing in different auditory contexts. This hypothesis was tested using the negative priming paradigm (offline) and the distractor-response binding paradigm (online, as replication). In prime and probe presentations, participants had to identify target sounds by key press responses while ignoring distractor sounds. An additional tone without any response assignment functioned as auditory context. In the "common context" condition, the context started with the prime sound presentation and ended with the given prime response. In the "changing context" condition, the context started with the prime sound presentation. However, it changed after the prime sounds ended but before the prime response was given. Results from both experiments revealed significant binding effect in the common context condition but not in the changing context condition. These results indicate that the external context can temporally segment event files, and hence, provide the evidence of common context as a new binding principle.

Effects of complexity and similarity of interruptions on the resumption costs in a procedural task with sequential constraints

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Previous studies have shown adverse effects of interruptions on the execution of interrupted (primary) tasks in laboratory settings and work environments. Aim of this study was to examine to what extent interruption affects the post-interruption performance in a primary task depended on the interruption complexity and its similarity to the primary task in terms of cognitive resource demands. The verbal primary task used involved performing different task steps from memory in a prescribed sequential order. In Experiment 1, participants were interrupted between the steps by an interruption task

varying in complexity (1-back, 2-back task) and processing code (verbal, spatial). Resumption times (how fast the primary task is resumed) and sequence errors (resuming the primary task at the wrong step) were analyzed. While complex interruptions led to longer resumption times and more errors after interruption than the simple ones, the effects of processing codes were less straightforward. In order to investigate whether the latter finding was due to a serial memory demand of the interruption task, Experiment 2 was conducted. This time, two classification tasks differing in processing code (verbal, spatial) were used as non-sequential interruption tasks. However, no differences in post-interruption primary-task performance between verbal and spatial interruptions emerged. Moreover, a comparison of the two experiments revealed longer resumption times after an interruption with a serial memory demand than without such demand. This suggests that similarity in processing code does not play a role for interruptions of a procedural task, but that interruptions also demanding serial memory can be disruptive.

A novel diagnostic framework for Super-Recognizer identification

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Super-Recognizers (SRs) were initially reported a decade ago (Russell et al., 2009) as a collateral while developing tests for developmental prosopagnosia: a handful of individuals who excelled at various subprocesses of face cognition (discrimination, recognition, identification). Today, the topic of SRs sparks interest from groups seeking to enhance scientific knowledge, public safety, or their monetary gain.

With no immediate consequences of erroneous SR-identification, there has been no pressure to establish a clear SR-definition. Most researchers accept “high” performance on the most widely used test of face recognition (CFMT+; Russell et al., 2009), or performance “above a superrecognizer benchmark” on “any [test reported] in the superrecognizer literature” (Phillips et al., 2018). With tests differing in the subprocess measured, sensitivity, and specificity, the resulting heterogeneity of available empirical evidence is unsurprising.

Here, I present a needed formal framework for SR-diagnosis (Ramon, under revision). Using this framework, I have to date identified 60 cases that are being studied in my lab in the course of a long-term, multi-methodological research agenda involving academic and government collaborators. With its stringent diagnostic criteria this framework aims to provide the foundation with which SRs’ informative value as a special population can be used to advance both science and application. Beyond SRs’ imminent real-world value for law enforcement, their study can advance our understanding of brain functioning.

Generalisation in bumblebees: transference of learning between sensory modalities

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Bees offer excellent opportunities for exploring how evolution has shaped generalisation behaviour, as the flowers that they rely on can produce hugely variable cues across multiple sensory modalities within a noisy and variable environment, where the information produced by differing modalities often correlates in its structure. We will focus on learning experiments where bees are taught to identify a signal in one modality (patterns of scent), and are then able to transfer these learnt patterns to a different modality (visual patterns that are spatially identical to the learnt scent patterns).

How to measure metacognition? Evaluating type 1 error rates of traditional and hierarchical measures of metacognitive accuracy

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A key aspect of metacognition is metacognitive accuracy, i.e. the degree to which confidence judgments differentiate between correct and incorrect trials. Experimental research on metacognition is hampered by the fact that there are multiple measures of metacognitive accuracy, giving researchers ample opportunity for cherry-picking results. In the present study, we investigated type 1 error rates by hierarchical bootstrap resampling from the confidence database, a large online collection of confidence data sets, in order to accurately represent the statistical properties underlying confidence judgements. In contrast to recent claims in the literature, all measures that required the traditional first-level analysis for each single participant and as subsequent group-level analysis of the measures of metacognitive accuracy determined during first level analysis performed fine in terms of type 1 error rates, including gamma correlations, Yates' scores, meta-d', meta-d'/d', and type 2 ROC curves. Measures based on hierarchical models did not always perform equally well: Hierarchical logistic regression was associated with dramatically inflated type 1 error rates when random slopes were omitted from model specification. Concerning hierarchical meta-d, the type 1 error rate was acceptable only if the Markov chains underlying the computation of hierarchical meta-d converged. We suggest that newly proposed measures of metacognitions should not be trusted unless they are accompanied by a rigorous examination of type 1 error rates.

Unexpected Receipt of Advice: Features of the Judge-Advisor System Reassessed

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In advice taking research, participants typically know about the opportunity to revise their estimate in light of advice when forming their initial judgment. The present research therefore addresses the question of whether judgment formation and weight of advice (WOA) depend on the expectation of advice and thus whether research findings in the field are a function of this feature of the judge-advisor system (JAS). In two online experiments (N1 = 252; N2 = 313), the typical condition with full information about the experimental procedure ("high-information") is contrasted with a "low-information" condition in which the procedure is not introduced in advance. We assumed WOA to be lower in the low-information than the high-information condition due to differences in triggered levels of construal. Consequently, we also expected accuracy gains to be impaired. By means of multilevel modeling with random intercepts for participants and items, our hypotheses were not supported in either of the two studies: Overall, there are no significant differences in WOA across conditions. This preliminary evidence demonstrates the external validity of the JAS. The expectancy feature of the paradigm apparently does not constitute an important boundary condition for the study of advice taking behavior.

Influences of task and person in an eye-tracking based of the Trail-Making-Test

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Human behavior is affected both, by the current task and by relatively stable characteristics of the individual person. Traditionally, task and person parameters are studied in isolation, by experimental and differential psychology. However, applied fields as neuropsychological diagnostics require knowledge about whether diagnostic scores were more indicative of the task or of the person. Here, we propose a novel solution to this problem by quantifying how diagnostic scores are affected by task manipulations or intrinsic person parameters. To this end, we manipulated participants' task set (their speed vs. accuracy emphasis) in an eye-tracking version of the widely used Trail-Making-Test (TMT). We combined this with a statistical assessment of individual differences in a number of variables provided by this test. Our results revealed that examined measures of TMT performance reflect distinct sets of parameters: Parameters that are primarily influenced by the task (i.e. the speed vs. accuracy task set) and parameters that are primarily influenced by the relatively stable characteristics of the individual person. In this way, the results shed new light on the parameters that are useful for improving neuropsychological diagnostics. In addition, the new method offers a way to bridge experimental and differential approaches in a quantitative fashion.

Efficient sampling using Randomized Response Techniques Part I: Curtailed Sampling

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Randomized Response Techniques (RRTs) aim at increasing the validity of measuring sensitive attributes by eliciting more honest responses through anonymity protection of respondents. The key element of these techniques is a randomization procedure in the questioning design that ensures anonymity protection. On the other hand, this randomization increases the sampling variance of the resulting estimates and, therefore, increases sample size requirements. The present work aims at countering this drawback by combining RRTs with curtailed sampling, a sequential sampling design in which sampling is terminated as soon as sufficient information to decide on a hypothesis is collected. In contrast to open sequential designs, the curtailed sampling plan includes the definition of a maximum sample size and subsequent prevalence estimation is easy to conduct. Using this approach, resources can be saved, such that the application of RRTs becomes more feasible.

Experimental Induction of Shame: A Comparison of shame- and dissociation-related audio scenarios

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Shame is associated with various psychological disorders. Dissociation as a disintegration of different parts of consciousness can be a form of avoiding feelings of shame, but empirical findings suggest that acute forms of dissociation can also activate feelings of shame, especially in the presence of a close person. To investigate this mutual influence, modified paradigms by Dorahy et al. (2017) and McKeogh et al. (2018) were applied in an online study (N = 242). Shame and dissociation were measured by self-report questionnaires before and after listening to auditory scenarios of shameful (condition 1) or

dissociation-related situations (condition 2). To check how condition affects changes in state shame and dissociation, an extended latent change score model was constructed using multi-group modeling. An estimation of latent change variables (of state dissociation and shame) was performed considering the influence of the state characteristics at T1. Thus, the estimators of the latent variables could be compared between groups and regression analyses could be performed. A negative correlation between state dissociation and shame was expected after shame induction, a positive correlation after dissociation induction. Controlling for trait shame and dissociation, a significant increase in state shame could be observed after shame, not after dissociation induction. In both conditions, the change in trait dissociation positively predicted the change in state shame. Furthermore, post-traumatic stress and relationship problems, trait shame and dissociation could be positively predicted. A positive feedback between state dissociation and shame is concluded. Non-significant results are discussed against the background of the methodology.

The Subjective Timing of Object Recognition and Affect

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Temporal order judgments (TOJs) and simultaneity judgments (SJs) were used to estimate the latency of the recognition of objects shown in pictures, and the pleasant and unpleasant feelings evoked by them. Participants viewed pictures that elicited either pleasant or unpleasant (disgust) feelings. At six time intervals before and after picture onset, a visual probe stimulus (two bars shown next to the top and bottom of the picture) was presented. In separate blocks of trials, the participants indicated when they recognized the object shown in the picture, and became aware of the pleasant or unpleasant feeling evoked by the picture: before or after the probe (TOJ experiment), or simultaneously with the probe or not (SJ experiment). Psychometric functions were fitted to the data of the individual participants to determine the point of subjective simultaneity between the target event and the probe. In both tasks, the latency of object recognition was shorter than the latency of affect for most participants. This suggests that the semantic classification of objects is necessary for feelings to arise. The results are consistent with findings obtained by the authors with an alternative method of subjective time measurement, the rotating spot method. The results have implications for several controversial issues of emotion psychology.

When perspective-taking threat manipulations are evidently threatening: uncovering the role of delay.

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Research on threat shows that defensive responses following explicit threat can only be detected after a delay, whereas indicators of threat, such as effects on affect, might only be deemed assessable when no delay is present. In fact, having a delay task before assessing control as specific indicator of a control threat is still under discussion. Based on patient studies, we theoretically assumed that experiencing a control threat in the health context would reduce perceived personal control whereas making an agentic ingroup salient might prevent or attenuate this effect. To test this buffer experimentally, we conducted ten studies with non-patient samples (total N = 3,391) inducing a health-related control threat with a perspective-taking manipulation. We first varied samples, recruitment, and identity salience manipulation types while having a delay between manipulating and measuring control. Here, across Studies 1 to 5, there was no evidence for the expected buffer. However, only if there was no delay task, we found the effect of threat on control in Studies 6 to 8. Subsequently, we incorporated

the identity task into the threat vignette in Studies 9 and 10 so that there was an ingroup salient but still no delay task present. In both studies, we then found the moderating effect of social identity salience on control. Thus, we need to discuss these findings in the context of the literature and their ability to give new insights into the temporal dynamics of control threat defence and biased perception of threatened control.

Learning in anticipation of reward and punishment: Perspectives across the human lifespan

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Pavlovian biases influence the interaction between action and valence by coupling reward seeking to action invigoration and punishment avoidance to action suppression. In this study we used an orthogonalised go/no-go task to investigate learning in 247 individuals across the human lifespan (7-80 years) to demonstrate that all participants, independently of age, demonstrated an influence of Pavlovian control. Computational modeling revealed peak performance in young adults was attributable to greater sensitivity to both rewards and punishment. However in children and adolescents an increased bias towards action but not reward sensitivity was observed. In contrast, reduced learning in midlife and older adults was accompanied with decreased reward sensitivity and especially punishment sensitivity. These findings reveal distinct learning capabilities across the human lifespan that cannot be probed using conventional go/reward no-go/punishment style paradigms that have important implications in life-long education.

No Evidence of Implicit Misattribution of Valence During Evaluative Conditioning

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Evaluative conditioning (EC) is frequently used to study attitude formation based on mere co-occurrences. Yet, the processes potentially underlying this effect are the subject of intense debates. Here, we test the Implicit Misattribution Model (Jones et al., 2010), as one of the most prominent models of EC. We establish a new and sensitive measure which tests implicit misattribution effects immediately after stimulus pairings in the conditioning phase and thus close to their suggested origin during pairing. In four preregistered online experiments (total N = 649), EC effects were present immediately after a pairing in the conditioning phase and these “online” EC effects predicted EC effects after the conditioning phase. Yet, while implicit misattribution is presumably promoted by simultaneous stimulus presentation, neither EC effects during nor after conditioning were affected by manipulating the simultaneity of stimulus onsets. Together, our findings question the validity of the Implicit Misattribution Model and provide evidence against one popular mechanism of unaware attitude formation.

The role of hand position in action imagery of typing

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In action imagery (AI), the body position and therefore actual proprioceptive information about the own body may diverge to different degrees from imagined the imagined body position and therefore imagined proprioception. It is assumed that AI is more difficult with larger discrepancies in actual and imagined body position. In three experiments, we investigated the role of the hand position during imagined typing and analyzed typing durations and attentional focus. In all experiments, participants performed an execution condition, an imagination condition in which the hands were lying flat next to the right and left side keyboard, and a second imagination condition. In the second imagination condition, the hands were either next to the keyboard with clenched fists (Experiment 1), lying flat on the right and left side of the screen (Experiment 2), or on the back of the participant (Experiment 3). Concerning durations, no significant differences between conditions were observed in Experiment 1. However, in Experiment 2, imagination with hands on the sides of screen was significantly shorter than execution, and in Experiment 3, imagination with hands on participant's back was significantly longer than imagination with hands next to the keyboard. In all experiments, systematic differences between conditions were observed in attentional focus. For instance, participants paid more attention to the movement of fingers in most imagination conditions than in execution conditions. In conclusion, the data provide evidence that incongruence between proprioception/ actual body position and imagined proprioception/ imagined body position interferes with AI.

The effect of background speech on attentive sound processing: A pupil dilation study

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Everyday cognitive tasks are rarely performed in a quiet environment. Quite on the contrary, very diverse acoustic signals can involuntarily deviate our attention from the task at hand. The present study aimed at disentangling the effect of task-irrelevant speech upon voluntary and involuntary attention. Beside behavioural measures, we also measured changes in pupil diameter in response to sounds, a psychophysical measure tightly related to attentional processes. We recruited 41 native German speakers who had neither received formal instruction in French nor had extensive informal contact with this language, and tested the effect of task-irrelevant speech upon an auditory discrimination task. Participants performed a sound duration discrimination task containing frequently repeated standard sounds (80 %) and rarely and randomly presented deviant sounds (20 %) sounds while a story was read in German or (unintelligible) French in the background. Our results revealed that, whereas effects of language intelligibility were not detectable on performance in the sound discrimination task, participants' pupil dilated more when background speech was played in unintelligible French compared to German, independent of sound type. This could suggest that the foreign language was easier to ignore, leaving participants with more attentional resources to analyse the sounds of the discrimination task. Our results highlight the potential of the pupil response for the investigation of subtle cognitive processes that might not surface when only behaviour is measured.

Groups live and in full color: Using the HoneyComb© game, visual analytics, and network analysis to capture group processes

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Group processes are dynamic, emergent, and fluid over time. Yet, methodologies that can truly capture these qualities are scarce. In a new methodological development, we combine the HoneyComb© experimental paradigm (Boos, Pritz, Lange, & Belz, 2014), a game-based assessment, with visual analytics and network analysis. In this way, group processes, such as group coordination or leader-follower-behavior, can be investigated in great detail and analyzed in both exploratory and confirmatory ways, as well as with both a static and dynamic focus. Due to this versatility, this methodological approach is especially suitable for research on group processes and can make their inherent qualities the focal object of research.

To illustrate these claims, this talk will present one empirical example in which 150 human participants (50.7% female) play one version of the HoneyComb© game. In this version, participants need to decide which of four pre-programmed “leaders” they want to follow in order to earn a monetary reward. Participants need to infer the qualities of the leaders throughout 30 consecutive game rounds. Participants played the game with four computed leaders either as the only real player or in a group with five other real players. Participants playing in a group were either incentivized to remain with the group throughout the game or did not receive incentives. We demonstrate that using this approach provides unique insights into these group coordination and leadership processes and their specific qualities: dynamics, emergence, and fluidity.

Lonely hearts: an fMRI study on interoception in aging and loneliness

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Interoception refers to the sensing of the internal bodily states. It is crucial for maintaining homeostasis and relevant for emotional and social processes. Interoception is a multifaceted construct encompassing three dimensions: accuracy, which refers to individuals’ ability to correctly track their own physiological states, sensibility, indicating the subjective perception of one’s own interoceptive accuracy, and awareness, defined as the relationship between (objective) accuracy and (subjective) sensibility. Previous studies showed that interoceptive accuracy worsens with aging, while others suggested a complex relationship between interoception and social connectedness, a state that changes with aging. However, no studies have so far investigated the relationship of aging and loneliness with all three interoceptive dimensions, nor the underlying neural mechanisms. Thus, this was the aim of the present study.

To this purpose, 63 young and 52 older adults underwent a classic heartbeat counting task while lying in the MR scanner. Heartbeats were measured with a pulsemeter attached to the index finger. An exteroceptive (counting tones) and a time estimation condition were included as control conditions and accuracies were calculated for each condition. Sensibility was measured via a self-report questionnaire, the Multidimensional Assessment of Interoceptive Awareness, and via confidence ratings during the task. Interoceptive awareness was subsequently calculated. Loneliness was measured with the UCLA Loneliness scale. Behavioral and neuroimaging data will be analyzed within mixed-effects models framework. This study will extend previous results regarding interoception and its neural correlates in the aging population and will shed light on the complex relationship between interoception, aging and loneliness.

Good vibes! Time-based expectancy for vibrotactile stimulation

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When a particular stimulus is presented more frequently after a certain time interval than another, people tend to adapt their behavior to such regularities by responding faster and more accurately to frequent interval-stimulus combinations than infrequent ones. This is known as time-based expectancy (TBE). In two experiments presented here, we investigated TBE for vibrotactile stimulation in a binary randomized forced choice task. Participants responded by keypresses to vibrotactile stimulation to their index and middle fingers and either a short or a long preparatory interval preceded this stimulation. In a first experiment, interval duration did not predict vibrotactile stimulation but was meant to check whether expectancies could nonetheless arise because of a natural, a priori mental association between interval durations (short/long) and response sides (left/right). In a second experiment, we investigated whether participants could form expectancies for vibrotactile stimulation when two different interval durations (short/long) and finger stimulations (left/right) were correlated and this correlation differed in probability. Our findings showed no evidence for an a priori TBE for vibrotactile stimulation, but indicated that it can be experimentally induced. Indeed, participants in the second experiment showed faster and more accurate responses for frequent combinations than infrequent ones, placing these results in line with previous literature on TBE in other domains.

A Replication and an Extension of the Cocktail Party Phenomenon

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The cocktail party phenomenon refers to the ability of the attentional system to detect highly relevant stimuli such as one's own name in the irrelevant message during a selective listening task. We conducted a preregistered replication of the phenomenon, in which we also tested whether semantically unexpected words have a similar effect, and whether individual differences in working memory capacity are related to the ability to detect one's own name or unexpected words in the irrelevant message. Twenty-nine percent of the participants reported noticing their own name, and those who did made more errors on relevant, to-be-shadowed words presented around the time of the name. Low span participants were more likely than high span participants to notice their names and to commit shadowing errors concurrently to the presentation of the name or shortly after. Semantically unexpected words, in contrast, were rarely detected and they were not associated with shadowing errors in the relevant message. Our results demonstrate once again that highly relevant stimuli such as one's own name are capable of attracting and capturing attention for a short period of time. Our results also demonstrate that unexpected words within sentences do not belong to this category of stimuli.

Raising a Finger for Numbers

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Numerical development seems grounded in embodied experiences. This is supported by evidence suggesting influences of fine motor skills (FMS) as well as finger sensory skills such as finger gnosis but also finger-based numerical strategies (e.g., finger counting) on children's numerical development. The current symposium aims at integrating findings from both strands to better understand the working mechanisms driving the relation between FMS/finger gnosis, finger-based strategies and numerical abilities.

To start with, Roesch will present results on the differential association of FMS and finger gnosis with procedural and conceptual aspects of arithmetic in preschoolers, supporting the hypothesis of a functional relation between FMS, finger gnosis, and arithmetic. Expanding on this, Asakawa will report findings indicating that the relation between FMS and arithmetic is mediated by preschoolers' counting schema. This indicates that preschoolers, who operate their fingers properly, do also count better and, thus, show better arithmetic abilities. U. Fischer will talk about results indicating a differential association of specific facets of FMS with preschoolers' numeracy and literacy skills. Furthermore, Salehzadeh et al. will present data that aimed at decoding finger numeral configurations using EEG data and machine learning. They observed that a supervised learning classifier was able to distinguish between ERP amplitudes for the recognition of different finger-based strategies better than chance-level. Finally, Felisatti and Fischer will present how Leap Motion (a hand motion tracker that determines the user's finger configurations through optical sensors) can be applied in a priming paradigm from Arabic numerals to finger configurations to understand how visual and motor aspects of finger counting contribute to the development of embodied numerical cognition.

The impact of finger gnosis and finger agility on preschoolers' arithmetical abilities

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Previous studies repeatedly showed that basic finger sensory and motor skills such as finger gnosis and finger agility are associated with the numerical abilities. In the present study, both predictors were considered jointly for the first time with regard to their relevance for initial calculation abilities in pre-school age (Mage = 5,62). The results of 452 children indicated that (i) finger gnosis and finger agility were significantly associated with initial calculation abilities beyond influences of age, gender, maternal educational attainment, and general cognitive abilities. (ii) Both predictors were also associated with initial calculation abilities when the influence of the respective other was controlled for. (iii) Moreover, there were differential associations with procedural and conceptual aspects of initial calculation: Good finger gnosis increased the logarithmic chance for being classified as learner with procedural arithmetic abilities instead of being not yet able to solve simple calculations. A similar tendency was observed for finger agility. However, this pattern did not apply for conceptual counting abilities. Overall, these results substantiate previous findings and support the hypothesis of a functional relationship between finger gnosis, finger agility and initial calculation abilities, which might further be influenced by finger-based numerical strategies.

The temporal correlation and spatial disparity of audiovisual signals inform multisensory causal inferences

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Humans integrate signals across sensory modalities to obtain multisensory representations of their environment. However, the brain needs to integrate multisensory signals only if they arose from a common cause, but has to segregate signals from independent causes. Thus, humans need to infer the causal structure of multisensory signals from the signals' spatiotemporal correspondence. Previous studies demonstrated that multisensory causal inferences depend on the spatial and temporal disparity of multisensory signals as well as their temporal correlation. Yet, because the temporal correlation of signals is inherently confounded with their temporal disparity, it is difficult to disentangle the contribution of both factors to causal inferences. To investigate the unique effect of temporal correlation and spatial disparity on multisensory causal inferences, we presented participants (N = 16) with a sequence of audiovisual spatial stimuli with a high or low temporal correlation while experimentally controlling for the temporal disparity of the stimuli. Participants localized the auditory stimulus and judged the stimuli's causal structure (common vs. separate sources). As predicted by the causal inference model, participants predominantly inferred a common cause if the stimuli's spatial disparity was low and their temporal correlation was high, without an interaction effect of both factors. For these conditions of a likely common source, participants' auditory localization responses were more strongly biased towards the visual stimulus location (i.e., the ventriloquist effect). Thus, our data demonstrate that the temporal correlation and spatial disparity of audiovisual signals additively inform multisensory causal inferences and, therefore, audiovisual spatial perception.

Masked number priming with CRT and LCD monitors: A solid test for the use of LCD monitors in masked visual computer experiments

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For decades, cathode ray tube (CRT) monitors have been the standard for visual stimulus presentation in experimental psychology. Nowadays, these monitors are replaced by liquid crystal displays (LCDs). Early generation LCDs were, however, often found to yield imprecise and unreliable stimulus presentation (e.g., Elze & Tanner, 2012; Wiens & Öhman, 2007) and the high variation of specific characteristics in current general models (Elze, 2010a) puts into question whether they can be used for experiments which require millisecond precise presentation times. We conducted a study aiming to examine whether LCDs can even be used for experiments requiring masked presentation conditions, if the differences in the technical characteristics of LCDs and CRTs are accounted for. Participants were administered a masked number priming task and a subsequent forced-choice prime discrimination task at a CRT as well as a LCD monitor. Using sequential Bayesian testing, we found no evidence for monitor differences. Specifically, we obtained evidence for masked number priming under conditions of zero awareness with both monitors. Beyond presenting this evidence, I will give some background information about the critical technical parameters considered for this study.

Visual acuity as a function of contrast for normal-sighted participants and for a cataract patient

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Cataract is a structural change in the lens of the eye, in which the clouding of the lens leads to a reduction in visual acuity and reduced contrast sensitivity. However, contrast sensitivity tests are rarely used in ophthalmological practice. Here, as an alternative, we present an efficient way to measure visual acuity at different contrast levels. Based on the subjective observation of a cataract patient with visual function limited particularly under high and low contrast but not as much under medium contrast, we aimed at comparing visual acuity at varying contrast levels. Visual acuity was determined binocularly in 13 normal-sighted participants and in the cataract patient before and after surgical replacement of the eye lens for high, medium and low contrast. The results of the normal-sighted participants are comparable to those found in other studies. Visual acuity hardly changes between a high or medium contrast presentation but decreases significantly at low contrast. The subjective observation of the cataract patient was confirmed. The cataract patient showed the best visual acuity under medium contrast. This peculiarity disappeared after replacement of the eye lens. To the best of our knowledge, no findings have been reported for either normal-sighted persons or cataract patients about an improvement in visual acuity with a reduction in contrast. Whether this effect is bound to the cataract condition is an interesting question that deserves further study.

Aesthetic judgment of object pictures is influenced by processing difficulty and arousal

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Theories of aesthetic experience assume that the ease of perceptual processing (e.g., Reber et al., 2004) and the arousal of a picture (Berlyne, 1971) influence the aesthetic impression of pictures. We investigated these assumptions by manipulating the background color of pictures depicting black chairs and tables. In Experiment 1, high contrast pictures on colored background should ease processing compared to low contrast ones. In Experiment 2, a low frequent background color (presented only in 25% of the trials) should enhance arousal to depicted objects compared to those presented on high frequent background color (75% of the trials). In both experiments, participants first executed a speeded discrimination response concerning the object type. In a second phase, familiar objects and newly added ones were presented on white background. Participants rated their aesthetic impression concerning the beauty and the arousal of the objects as well as their familiarity with them. The results of Experiment 1 showed that objects presented with high contrast were processed faster, were judged to be more familiar, and were rated as being more aesthetic than objects presented with low contrast. In Experiment 2, we found no advantage for objects presented on the infrequent background color for reaction times and familiarity ratings, nevertheless, objects presented on an infrequent background were judged as more arousing than objects presented on a frequent background color. Taken together, the results support the assumption that processing difficulty and arousal level associated with object pictures are relevant when judging their aesthetic value.

Large sample re-analysis of execution-based and verbal code-based stimulus-classification and stimulus-action associations

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Stimulus-response (S-R) associations form when stimuli and responses co-occur. Automatic S-R retrieval then leads to repetition benefits (e.g., Henson et al., 2014). Importantly, S-R associations consist of stimulus-classification (S-C; apple–small) associations between stimuli and their task-specific classifications and stimulus-action (S-A; apple–right) associations between stimuli and specific motor outputs (e.g., Moutsopoulou et al., 2015). Both can be acquired by actively responding (execution-based) or by passively attending to a stimulus while the associated classification and action is presented verbally (verbal code-based; e.g., Pfeuffer et al., 2017). Using linear mixed models, we jointly re-analyzed eight item-specific priming experiments (N = 460) in which participants classified objects based on either size or mechanism by pressing a left/right key. Between an item's prime and probe (lag 2-7), the classification task and/or action mapping either repeated or switched independently. This allowed us to independently assess S-C and S-A repetition benefits. Replicating the results of the individual experiments, the model yielded significant S-C and S-A repetition benefits for both execution-based as well as verbal code-based stimuli. However, contrary to the individual experiments, we observed stronger S-A repetition benefits for S-C repetitions compared to S-C switches for execution-based stimuli. This suggests that S-A associations were partly encoded and/or retrieved subordinate to S-C associations. Nevertheless, substantial S-A repetition benefits remained when S-C mappings switched.

Are some people more susceptible to anchoring effects than others?

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When an arbitrary number is considered prior to making an estimate, the estimate will be biased towards that arbitrary number. Although this anchoring effect is highly robust with effect sizes up to $d = 2.5$, its causes are less clear. To achieve a better understanding of anchoring, the current research focuses on moderators. I summarize 14 years of personality moderator research on anchoring including meta-analyses on eight different personality traits and show that it has been doomed to fail in identifying personality moderators: The traditional method of assessing the susceptibility to anchoring is neither theoretically founded nor does it yield reliable scores. I present results from two preregistered experiments that have tested multiple approaches of reliably measuring the susceptibility to anchoring and discuss concerns about the existence of susceptibility to anchoring as a trait.

Age differences in interruption processing - Evidence from posterior alpha oscillations

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It has been shown that interruptions impair working memory performance, especially in the elderly. However, it is unclear how the electrophysiological correlates of interruption processing differ between younger and older age groups.

In our study, participants maintained lateralized presented information for later recall. This primary task was frequently interrupted by either a low- or high-demanding arithmetic, secondary task. At the end of each trial a retro-cue indicated which information had to be retrieved.

Analysis of behavioral data demonstrates that interruptions impaired working memory performance as well as motor preparations processes more strongly in the older compared to the younger age group. Interestingly, the younger adults were more affected by a high-demanding interruption compared to low-demanding interruption, while no such difference was evident in the elderly.

The effects of interruptions on working memory performance were mirrored on EEG level. Interruptions impacted the refocusing of attention on the primary task more strongly in older compared to younger adults, as indicated by decreased posterior alpha power suppression following the retro-cue.

In conclusion, we were able to show that older adults were affected more strongly by interruptions compared to younger adults. Furthermore, we could identify neurophysiological markers of differences in interruption processing between both age groups.

No reduction of between-task interference with a repeating sequence of SOAs

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A frequent observation in dual-tasking is that spatially or conceptually (in)compatible Task 2 response features can interfere with responses in Task 1 (backward crosstalk effect; BCE). Such between-task interference can be, at least to some degree, under strategic control. It has been shown that the size of the BCE can be modulated by instructions, contextual regularities, recent experience of conflict, and motivational factors. Especially large temporal task overlap (i.e., short stimulus-onset-asynchrony, SOA) represents a condition of high levels of between-task interference. Accordingly, Fischer and Dreisbach (2015) showed that specific stimuli, associated with mostly short SOAs, were able to reduce the size of the BCE. In the present study, we investigated whether a regular sequence of SOA levels can also be used for contextual regulation of the BCE. In a dual-task with spatially (in)compatible hand- and foot-responses, we implemented a repeating sequence of three SOA levels. If participants learned this sequence and used it strategically, the BCE should decrease over time in regular sequence blocks but should increase in a subsequent random sequence block. However, this prediction was not confirmed in two experiments (N=32 each). Instead, the size of the BCE was constant across all blocks (BFs < .01 for the respective interactions). This is a first important result, as it points at the necessity to further disentangle the type of contextual regularities that can serve the shielding against between-task interference.

Glance behaviour as indicator for wear of technical components

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The comprehensive networking and automation of production in context of industry 4.0 requires the implementation of cyber-physical systems. Its extension to a cyber-physical-human system through the establishment of a cognitive model needs a suitable representation and formalization of human expert knowledge and cognitive processes. In this context, mobile eye tracking for identifying visual information searches and attentional behaviour is a first important part in the acquisition of psychological data.

To investigate and develop cognition-based production assistance for atmospheric plasma spraying (APS), several spray cycles with different cathode states (new, partially and completely mechanically modified as well as worn by arc erosion) were carried out for a comparative study. The experienced operator is able to assess deviations in the technical process based on visual and auditory information as well as implicitly deduce the cathode state visually using the fluctuation of the plasma jet. For this purpose, the gaze of the operator during the procedure was tracked and the plasma in the raw visual recordings of the glasses scene camera was also automatically detected using video analysis methods. In the spray process with a badly worn cathode, unusually long fixation times (> 20s) were observed. The progression of the pupil diameters during these fixations suggests a high mental strain on the operator. This assumption is supported by the lack of a relation with the brightness progressions of the detected plasma jet.

Experimental research on goal disengagement processes - methodological approaches, initial findings and challenges for future research

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Goals and processes of goal regulation are omnipresent phenomena of everyday human life and much-researched concepts in psychological science. However, the majority of research has focused on processes of successful goal pursuit for a long time, whereas goal disengagement processes were rather neglected. Since the 1990s several (meta-)theories from developmental psychology have pointed out the significance of goal disengagement processes for the individual's development and quality of life given, for instance, blockades in goal pursuit. Despite these insights little is known about what exactly constitutes goal disengagement processes and which conditions facilitate or impede such processes. Moreover, most studies addressing goal disengagement processes apply observational and quasi-experimental designs. But in order to approach a causal explanation of goal disengagement processes, experimental studies are indispensable. In this symposium, methodological approaches and first results of such studies will be presented in order to discuss the challenges of experimental goal disengagement research and to develop ideas for fruitful future research. In particular, after one introductory theoretical talk (Greve et al.), four talks will present studies that include experimental manipulation of (1.) the goal itself (Rühls et al.) and/or (2.) the goal blockade (Rühls et al., Mayer et al.) and/or (3.) processes that are assumed to be causal for or constitute goal disengagement (Kreibich et al., Marion-Jetten et al., Mayer et al.). On the content level, Rühls et al. (Talk 2) address the question how social goals can be induced and blocked in experimental settings. In talk 3 to 5, the focus lies on factors assumed to influence goal disengagement processes. Mayer et al. (Talk 3) investigate how missing possibilities of continued goal pursuit could affect goal disengagement and take a closer look at the temporal dynamics of the processes. Kreibich et al. (Talk 4) and Marion-Jetten et al. (Talk 5)

finally deal with the connection between self-awareness and problem-solving (Talk 4) or mindfulness (Talk 5) and the experience of action crises, which are assumed to play an important role in processes of goal disengagement.

Inducing and blocking social goals in experimental settings: Developing a paradigm for goal disengagement research using Cyberball

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Although the functionality of individuals' goal disengagement capacity for well-being has been empirically demonstrated in various contexts, little is known about its process-related components. To address the research gap regarding causal processes associated with goal disengagement as response to goal blockage, we developed an experimental paradigm in which social goals can first be induced and then be blocked. In three studies we tested first variants of this paradigm and ways of capturing goal regulation processes. The goal of belonging to a group was always induced via a mixture of group-tasks (e.g. brainstorming, minecraft, cyberball). Two studies dealt primarily with the question whether the goal induction can succeed in this way. In study three the induced goal was then blocked in the experimental group via exclusion from the group using the cyberball-game. By conducting repeated measurement IATs to capture change in implicit group evaluation and group identification (study 3) and by applying a measure of attention focus (study 2), we included subpersonal measures of processes associated with goal disengagement within the paradigm, which have also received too little attention in research so far. Taken together, the studies' results indicate that the paradigm based on cyberball allows the induction and then blockage of social goal pursuit in an experimental setting. Furthermore, first approaches could be tested, how both personal and subpersonal measures can be integrated within this paradigm to capture goal disengagement processes. Further research, especially regarding the valid measurement of subpersonal processes, is necessary to expand and further test the paradigm.

Discussion

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The contents of the symposium talks will be summarized and discussed.

How to deal with interruptions: attentional shifts between primary and secondary interrupting tasks are reflected in modulations of alpha and theta oscillations in the EEG

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In daily life situations, we often encounter interruptions, which are known to impair working memory (WM) performance. In this study, we explore the neurocognitive mechanisms underlying the handling of interruptions during WM processes by means of oscillatory patterns in the electroencephalogram (EEG). Participants were presented with two bars (on either the left or right side of a central fixation cross), followed by a pre-cue indicating a high or low cognitively demanding interruption (as compared to no interruption). After completing this secondary task, participants returned to the primary task and had to report the orientation of only one previously presented bar, as indicated by a retroactive cue

(retro-cue). Behavioral results showed that the angular error and mouse onset movement time were highest in the high-demanding interruption condition and lowest in trials without interruption. With respect to the EEG data, we found a lower frontal theta (4-7 Hz) power and a more increased posterior alpha power (8-14 Hz) in response to the retro-cue presentation after an interruption, indicating a reduced availability of attentional control resources. This result was furthermore supported by a reduced alpha lateralization after the retro-cue when subjects encountered an interruption task. These findings suggest that interruptions – especially highly demanding ones – interfered with the reallocation of attention to the primary task. They further emphasize the importance of neural oscillatory correlates of attentional control processes for investigating the detrimental effects of interruptions on working memory performance.

Understanding the Underlying Mechanisms of Societal Polarization Over Contested Science - The Role of Metacognition

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As societal polarization has increased over the recent years understanding its underlying mechanisms is becoming a more and more urgent matter. Current research has identified societal macro-phenomena as well as cognitive micro-level factors that explain how citizens reason about the science. In our research we take a different perspective asking the question: Does insight into own distortion of evidence impact polarization over the science? To this end, we investigated for a sample of N = 354 participants the role of metacognitive insight for group-level polarization for two topics: climate change, and nanotechnology. In this contribution we present our results showing that (a) metacognitive insight is related to group-level polarization for the heavily contested topic of climate change but not for the less heavily contested topic of nanotechnology and (b) that the polarizing effect of scientific evidence could be traced back to higher metacognitive insight fostering belief-updating in the direction of the evidence at the expense of own, prior beliefs.

Decoding ERPs for processing of canonical and non-canonical finger-numeral configurations

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Finger-numeral configurations (FNC) are used to represent numerosities, to count, and to do arithmetic across cultures. Montring and counting are two forms of FNC. Numerical information in montring, to a lesser extent in counting, configurations are recognized faster than non-canonical finger numerical configurations in adults (Di Luca & Pesenti, 2008; Soylu, Rivera, Anchan, & Shannon, 2019). Also, one ERP study showed evidence for montring configurations drawing larger attentional resources in early perceptual processing (P1/N1 range) but showing similar patterns of semantic processing (P3 range) with counting (Soylu et al., 2019). In this study, we used the same EEG dataset as in Soylu et al. (2019; Harvard Dataverse), which includes ERP data during recognition of montring, counting, and non-canonical FNCs, and used machine learning methods to test whether the ERP scalp distribution can be decoded to predict the type of FNC processed. A supervised learning classifier, Support Vector Machine (Bae & Luck, 2018), was trained using a subset of average ERPs of 38 participants to distinguish between the scalp distribution of ERP amplitudes for recognition of different finger-numeral configurations for different numerical values (1,2,3, & 4). The decoder was tested with unused average

ERPs to assess the trained algorithm's success in predicting the FNC type. Overall, the algorithm was able to predict specific configurations beyond chance-level. In the presentation, we will discuss the implications of findings for perceptual processing of finger-numeral configurations, and more generally, how ERP decoding methods can be used to inform research questions on number processing.

Affordances in the wild: Theoretical and methodological implications of ethnographic considerations

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The concept of affordance is central for embodied approaches in cognitive science. In the traditional ecological perspective, affordances are relational properties that are not reducible to the characteristics of an object or surface but are necessarily partly constituted by the sensorimotor makeup of the agent: in this view, objects afford grasping and surfaces afford walking not in and of themselves, but only for agents with certain characteristics. The relational nature of affordances makes them particularly interesting for embodied cognitive science: since affordances are meaningful possibilities for interaction that can be perceived, it follows that “meaning” belongs in the domain of perception-action rather than the domain of “high” cognition.

The usual approach to studying affordances is in artificially constrained laboratory situations. While recognizing the value of controlled experimentation, I argue for the benefits of additionally considering affordances “in the wild,” i.e., in the context of real-world activity. As an example, I describe ethnographic work on the introduction of cellphones in rural Ghana in the early 2000s, highlighting the unexpected, innovative uses that emerged in that unique context. This case, I suggest, shows the role that social, cultural, and developmental factors play in the perception and realization of affordances which often go unacknowledged in experimental laboratory research. Theoretically, the case raises questions about the definition of affordances, in particular how narrowly or broadly to conceptualize their spatiotemporal dimensionality. And methodologically, it poses the question of how experimental and observational research can help one another and contribute to our understanding of psychological phenomena.

Learning prosocial motives

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Empathy, i.e., sharing another's feelings, and reciprocity, i.e., reciprocating kindness, are two strong motives for prosocial behaviors. However, so far, it is unclear which of the two motives is more sustainable over time. Here we use a reinforcement learning approach to investigate how empathy and reciprocity motives develop and decay over time in the absence of further reinforcement. In the first phase of the experimental condition (corresponding to acquisition), we reinforced the respective motive (empathy/reciprocity) with high probability (80%) and in a second phase (corresponding to extinction) with low probability (20%). In a parallel control condition, the motive was randomly reinforced (50%) in both phases. We observed that in the experimental condition, the strength of the reciprocity motive closely mirrors the frequencies of reinforcement, i.e., increased in the first phase and decreased in the second phase. In contrast, the strength of the empathy motive increased in the first phase and persevered in the second phase. When modeling motive strength over time using a variant of the Rescorla-Wagner model, this difference in motive development was reflected by a

significant difference in one key model parameter (reflecting reinforcer sensitivity). Follow-up analyses revealed that this model parameter is likely to capture the motive dependent influence of emotional valence on motive development. Together, these results suggest (i) that the empathy motive might be more sustainable than the reciprocity motive and (ii) that differences in motive development over time can be well captured and described in terms of standard reinforcement learning models.

A Direct Comparison of Online and Offline Data for Two Dual-Task Paradigms

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The predominant concern with running experiments online is poor data quality resulting from the ‘uncontrollable’ and indirect environment especially for response time sensitive paradigms and small effects. To alleviate this concern, prior studies have shown that online data can be reliable and comparable to lab data in various cognitive tasks. However, direct comparisons of typical lab-based student recruitment and recruitment in the wild’ are sparse and limited to simple, one-dimensional tasks. In the present study we recruited participants and contrasted data from traditional lab-based sources and unconstrained online sources in two short dual-task paradigms. In both paradigms, online participants replicated the well-known PRP effect (psychological refractory period; Experiment 1) and showed dual-task costs (Experiment 2). As expected, variance in response times and error rates was higher in the online group. Thus, there is no general reliability issue with online experiments. It seems advisable to recruit more online participants than one would recruit traditionally to accommodate for the increased variance between participants and set well-considered a prior exclusion criteria.

Proximal and Distal Effect Monitoring

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Humans strive to produce goal-oriented changes in their environment. The ability to detect these changes, to monitor distal effects, is not only crucial in learning the relationship between actions and effects, but also for the detection of errors. Thus, action effect monitoring and error monitoring can be regarded as instances of a generic effect monitoring system: Both oversee our behaviour and check for changes in the environment. In two experiments (n=48 each), effect and error monitoring were examined using a dual-task setup. Task 1 consisted of a three-choice flanker task, and action effects were displayed after the response. Crucially, in some of the trials, a wrong effect was displayed after a correct response, whereas in other trials a correct effect was displayed after a wrong response. Thereby, response-errors and effect-errors could be assessed separately. Task 2 was a simple discrimination task and served to measure the monitoring process after response-errors and effect-errors. Task 2 responses slowed down after both response-errors and effect-errors in Task 1. These influences were additive, suggesting two independent monitoring processes: one for proximal events, catching body-related errors, and one for distal events, checking for environment-related irregularities.

Positive and Negative Reactivity in Judgments of Learning: Shared or Distinct Mechanisms?

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Judgments of learning (JOLs), predictions of one's future memory performance, are frequently used to assess metamemory. Recent research demonstrated that JOLs have reactive effects on memory performance. In particular, eliciting JOLs enhanced cued recall performance for related word pairs (positive reactivity), impaired cued recall performance for unrelated word pairs (negative reactivity), or both. According to the changed goal hypothesis, positive and negative reactivity are due to a single mechanism – people's shift from aiming to master all word pairs to focusing only on the word pairs that appear easy. In contrast, the dual-mechanism account assumes that positive reactivity is due to the strengthening of cue-target associations, whereas negative reactivity is due to dual-task interference. The present experiment (N = 72) tested the changed goal hypothesis and dual-mechanism account against each other by comparing cued recall performance for forward-related, backward-related, and unrelated word pairs across participants who did vs. did not make JOLs. Because both forward- and backward-related word pairs appear easy, the changed goal hypothesis predicts positive reactivity for forward- and backward-related pairs but negative reactivity for unrelated pairs. In contrast, the dual-mechanism account predicts positive reactivity for forward-related pairs but negative reactivity for backward-related and unrelated pairs. Results revealed negative reactivity for unrelated word pairs but no reactivity for forward-related or backward-related word pairs. Thus, our findings support neither theory but suggest that changed goals, strengthening of cue-target associations, and dual-task interference alone cannot account for JOL reactivity.

The Cognitive Self: On the structure of the self and on effects of self-relevance in cognitive information processing

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Human information processing is influenced by the information's inherent self-relevance, that is by its importance for the particular person. However, the exact ways in which the self is represented and in which self-relevance influences information processing is still under debate. In order to gain further insights onto these topics, the current symposium aims at suggesting an empirically-based conceptualization of the self and on providing an integrative overview on specific mechanisms causing effects of self-relevance as observed in a variety of different experimental paradigms. In detail, Sarah Schäfer will address the structure of the self and its borders and Marius Golubickis will discuss in how far self-related stimuli and personal belonging modulate the distribution of attentional resources. Merryn Constable will consider how identity relevant spaces (territory/peri-personal space) and joint tasks influence stages of the cognitive processing timeline and Pamela Baess will address the role of self-other differentiation and agency. Finally, Charles Spence will review evidence concerning the representation of the self in each of the senses, as well as in a multisensory context and also consider how self-effects can be used by advertisers. In sum, our symposium will enhance the understanding of the self and the cognitive mechanisms by which it impacts information processing.

How the self is built: Integration of others into the self-concept

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We are constantly influenced by content, which is in any form related to our self. Hence, a clear definition of our 'self' is of great importance. Research about the self-concept indicates a basic network of stimulus associations, a so-called 'minimal self'. So far, the minimal self is conceptualized as a network of features, comparable to the representation of a simple object. Investigations of the minimal self revealed a flexible and also functional integration of content into the minimal self. In order to further understand the mechanisms of self-integrations, we investigated the integration of another person into the minimal self by means of the so-called self-prioritization effect (SPE). Besides the typical SPE, which indicates a prioritization of self-relevant associations in a simple matching task, we tested for the prioritization of a teammate. If the integration of stimuli into the minimal self is comparable to basic feature bindings, then the pure co-occurrence of the self with the teammate should cause integration of the latter. Further, if self-integrations are functional, then the integration of a teammate should depend on the particular significance of this teammate. N = 50 participants showed a significant prioritization of the teammate, but this prioritization was larger when the teammate was sitting close to the participant than when the distance to the teammate was rather large. The results indicate a functional integration of other people into the minimal self and reveal further insights about how our minimal self is generated by demonstrating a comparability with feature bindings.

They shall dance! A comparison of the effect of drugs versus dancing to electronic music on the experience of trance.

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Dancing to music can induce states of trance and very pleasant or ecstatic experiences—particularly when the music is repetitive, monotonous, and rhythmic. This is why many cultural, religious, or shamanistic rituals have been accompanied by monotonous drum rhythms for thousands of years. Their remnants are still visible today in repetitive and rhythmic electronic music, mostly in the techno music scene. The consciousness-changing and trance-inducing effects of electronic music are similar to the effects induced by specific drugs. Albert Hofmann—the inventor of LSD—had already conceived this similarity and concluded that drugs shouldn't be more than just a catalysator for the entrance into states of trance, but that there is a much better means for young people: "They shall dance!" Whether dancing to electronic music and the intake of drugs indeed induce similar levels of trance was investigated with about 100 participants in a live club setting. About half of the participants had taken drugs, mostly Ecstasy, Amphetamine, and Cocaine. The Phenomenology of Consciousness Inventory (PCI) was used to measure trance. As hypothesized, the trance depth was similar for the participants who had taken drugs and the ones who had not. Equivalence testing also showed no difference between the two groups. The results show that dancing to electronic music can indeed have effects similar to the intake of drugs. This is relevant not only for the understanding of the effects of music and dancing in everyday life but also for therapeutic settings.

Adaptive Prospective Memory

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A central tenet of the adaptive-memory framework is that memory has not evolved to help us relive the past but to prepare us for the future. In reciprocal social exchange, it is important that people learn from previous experiences to approach cooperators and to avoid cheaters. In this sense, adaptive memory is inherently prospective. The present research tests this central assumption of the adaptive-memory framework. Participants played a Prisoner's Dilemma game and encountered cheating, cooperating, and neutral partners. The faces of these partners later reappeared during an event-based prospective-memory task. Participants were asked to press a specific key whenever one of these faces appeared. The authors found better prospective-memory performance for cooperator and cheater faces than for neutral control faces. Hierarchical multinomial processing-tree modeling served to separate the prospective component (remembering that an action needs to be performed) from the retrospective component (recognizing the target faces) of prospective memory. Superior prospective-memory performance for cooperator and cheater faces was due to a stronger prospective component, whereas the retrospective component remained unaffected. These findings suggest that prospective memory for cooperator and cheater faces may have an adaptive function for maintaining reciprocal relationships and for avoiding cheaters.

Advances in TVA-based visual attention research: Moving towards new stimuli, tasks, and data

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The idea that visual perception can be conceptualized as bias competition where possible visual categorizations race for encoding into visual short-term memory and biases stem from attentional and perceptual influences has a long history in psychological research. Claus Bundesen's Theory of Visual Attention (TVA) formalizes this process in a computational framework. This formal model links observable data to theoretical concepts with mathematical rigor. A focus on such formal models is important for progress in psychology, most importantly because formal models allow to derive quantitative hypotheses that can be tested experimentally and statistically in a strict way.

While earlier TVA-based research was mainly restricted to accuracy data from whole and partial reports of letters, the research in this symposium shows how TVA can be applied to a broader range of experimental data and situations. Petersen describes the decomposition of the attentional blink with TVA, which allows to judge the plausibility of different explanations how the bottleneck in processing occurs. Krüger, Rohlfsing, Wrede and Scharlau report an influence of negated instructions on two of TVA's attention parameters. Scharlau, Krüger and Tünnermann present how temporal-order judgements allow for application of TVA in games played on mobile devices and virtual reality. Both Kristjánsson and Tünnermann and Schubö look at visual foraging, a multiple-target version of visual search. They focus on how attentional templates, which are often assumed to guide visual search, are switched and how they fit in the TVA framework. Overall, the symposium provides an overview of recent progress in fundamental TVA-based research; we also want to discuss next steps in expanding TVA-based research.

A. Petersen, How to decompose the Attentional Blink

A. Krüger, K. J. Rohlfsing, B. Wrede & I. Scharlau, Effects of negation on visual processing capacity and attentional weight differences

I. Scharlau, A. Krüger & J. Tünnermann, The TOJ-TVA paradigm in games and virtual reality
Á. Kristjánsson, Visual foraging as a tool for assessing attention and working memory
J. Tünnermann & A. Schubö, Attentional templates in visual foraging: Insights from TVA

TVA in the wild - Using the TOJ-TVA paradigm in games and virtual reality

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As of yet, TVA has dominantly been used in restricted empirical scenarios such as whole and partial report and with strictly controlled stimulus material. We present a series of experiments in which we test whether the advantages of TVA can be exploited in more realistic scenarios with varying degree of stimulus control.

Using temporal-order judgments as a task, we show that the TVA parameters for processing capacity and attentional weight can be measured with sufficient precision in computer games (steering a space ship or cycling through a street scenario). The results do not deviate strongly from typical laboratory results, although we also discuss some systematic differences.

How Sampling Information Affects Epistemic Uncertainty and Risk Taking

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Whenever risk taking is based on information sampling, more information should decrease uncertainty, provided that it can be accurately integrated. This study examines the cognitive limits of sequential information integration and whether risk taking is adaptive to the actual uncertainty people face. A student population (N = 60) estimated the mean of number distributions from sequential samples and then bet on their estimation accuracy. Results show that an increase in sample size while controlling statistical uncertainty, decreased estimation accuracy, meaning that the actual uncertainty increased. Irrespective of actual sample size, the effective number of integrated samples was about four, indicating noticeable cognitive limits. However, participants' betting stakes and perceived probability of winning, hence their risk taking and perception, were well aligned with the actual (rather than the statistical) uncertainty. Consequently, supposed behavioral biases such as insensitivity to sample size in judgments, pessimism in probability updating, or little information search in decision from experience can be adaptive to given cognitive limitations.

A neural substrate for size perception in Virtual Reality

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Size constancy is a basic property of our visual system, yet recent results are difficult to reconcile with retinotopy of early visual cortex (Chen et al, 2019; Sperandio et al, 2021). Our ultimate goal is to resolve these issues by making neural measurements of size and distance perception in a dynamic, virtual reality (VR) environment.

Stimuli were flat 23x23 deg squares that appeared towards the front of a corridor and then moved away from observers. During the movement, the test squares could stay the same size, or shrink or grow. 9 Observers judged whether the stimulus grew or shrank, and matched the distance that the test square had reached. At the same time, the test squares flickered at 15 Hz, and we used standard procedures to measure steady state visually evoked potentials (SSVEPs).

Results show that observers tended to overestimate the distance of objects when they judge them to be growing, and to underestimate the distance when they judge them to be shrinking. This implies that size and distance estimates covary to create a coherent estimate, even though it is not always in line with the simulation of the physical world in VR. The resultant SSVEPs correlated with the sizes of stimuli. The SSVEPs tended to be larger in cases where the test stimuli grew and smaller when they shrank.

Our results show that the SSVEP represents a neural substrate of size perception that can be reliably measured in VR, even in situations where the observer moves around.

Binding and Retrieval of Control States

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How do we adapt to shield ourselves against distractors so that these do not prevent us from achieving our goals? This question is usually investigated through conflict tasks as e. g. the prime-target task. In particular, researchers are interested in the congruency sequence effect (CSE), which is characterized by a modulated influence of task irrelevant information after different levels of conflict. Theoretically, there have been two opposing explanations for this effect. While control accounts explain the CSE as top-down attentional adaptation process, binding accounts attribute this effect to the bottom-up binding of stimulus-response (S-R) associations. Recently, the idea was raised that not only S-R associations could be bound (and later retrieved) but also the state of cognitive control itself, i. e. an attentional configuration that is independent of a specific S-R combination.

In a first experiment we used a prime-target task in which we provided task-irrelevant context information. Based on previous research, we predict that in sequential trials the repetition of this context information enhances the retrieval of previously bound cognitive control and, therefore, leads to a stronger CSE. Going beyond these results, we wanted to replicate the rapid decay of S-R bindings for the binding of cognitive control. For this reason, we manipulated the retrieval delay speculating that longer delays impair the retrieval of cognitive control, i. e. a context modulation of the CSE. We will discuss the implications of the results for the integration and extension of control and binding accounts.

Figure, Ground, S-R Binding? – Figure-Ground Segmentation in a Distractor-Response Binding Task

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Stimuli and response features can be bound together by our cognitive system. This set of interconnections, termed event-file, can be retrieved later when some or all features comprised by the event-file repeat. Participants benefit from a full repetition of the event-file because the previous response can be recycled, while they experience interference when only some features repeated because the conflict between previous event-file and present demands of the situation have to be solved. However, it is not only information relevant to the action but also irrelevant information that is represented in an event-file and later retrieved - the so-called distractor-response binding effect. This two-folded process of distractor-response integration and distractor-response retrieval has been shown to be modulatable by which part of a scene the distractor is presented in. If irrelevant distractor information is presented as the background, no distractor-response binding effect is observed, while a regular binding effect is observed when the distractor is presented as a figure in front of the

background. However, previous research could not determine where this lack of binding from background occurred: Is the integration or the retrieval part of the processes influenced by this figure-ground segmentation problem? By manipulating whether the distractor is presented as background or figure at only integration or only retrieval, we show that integration as well as retrieval do not occur when the distractor is presented as the background – both processes are equally influenced by a background presentation. This suggests that the distractor-response binding effect does not extend to background information.

Blindsight and residual vision: How reliable is the redundant target effect as a diagnostic tool?

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Certain patients with homonymous visual field defects have residual visual capacities within their blind areas. This is called Blindsight. Blindsight has been tested with varying paradigms, including the redundant target effect (RTE). RTE describes a reduction in reaction times to a visual stimulus that occurs when a second stimulus is presented simultaneously. If the RTE occurs with the second stimulus in the blind area, we speak of blindsight. In this study, we evaluate the RTE as a diagnostic tool for residual vision. This leads to two questions. First, how reliably can the RTE detect the presence of visual capacity (i.e. diagnostic sensitivity)? This question can be addressed in full-vision observers and in the good field of hemianopic patients. In a group of healthy observers (n=53) we found that only 47% showed a RTE. Moreover, in a group of hemianopic patients tested at two different times we found that only 18% (time 1, n=11) and 25% (time 2, n=8) showed a RTE with both stimuli presented in their intact visual field. The second question concerns the specificity of the RTE: does the RTE correctly detect the absence of vision? This is best tested in the blind spot, an area reassuringly devoid of visual receptors. We found in a sample of healthy observers (n=19) that 87% of observers showed no RTE with the second stimulus presented in the blind spot. To conclude, the RTE shows reasonable specificity but very poor sensitivity. The RTE as a diagnostic tool for blindsight is therefore problematic.

Wearables and a sensor-based physical analogue scale: A pilot study about social media ostracism

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The use of Experience Sampling Method (ESM) has increased in frequency also due to new measurement possibilities (e.g., smartphones). Collecting longitudinal data in situ with ESM, however, is still challenged by limiting interruption burden, especially when assessments are frequent and/or must be made immediately after an event. Here, we report a novel approach by combining a wrist-worn sensor-equipped wearable with a Physical Analogue Scale (PAS). We make use of the wearable's sensors in order to assess the angle between a flat surface and the angular position of the participant's forearm (0° = low intensity, 90° = high intensity). Two pilot studies (4-week field study and lab study) and a 2-week ESM study on social media ostracism (i.e., when one's social media message is ignored; N = 53 participants and 2,272 event- and time-based assessments) provide data and empirical support for the feasibility as well as the advantages of this novel approach for event- and time-based assessments. PAS angles were accurate and reliable, and VAS and PAS values were highly correlated. Moreover, by finding that being ignored resulted in significantly stronger feelings of being offended, which was more pronounced when ignored by a group compared to a single person, past findings on

cyber ostracism could be replicated. Furthermore, it was not overly difficult for participants to complete the assessments using the wearable and the PAS. We suggest that the PAS is a valid measurement procedure in order to assess fleeting and/or frequent micro-situations in everyday life.

Context-dependent memory of motor sequences

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To examine influences of context changes between encoding and retrieval of motor sequences, we varied a number of encoding and retrieval features in a two lists approach. Participants consecutively learned two sets of three-finger movements at two different computer working places, all enacted with fingers of the right hand. We varied keyboard and display orientation, stimuli, background color, response keys, position of the hand, and the used PC between the two set. A final free recall test comprised either the same context features as present during study of the first item set or the ones present during study of the second item set or novel test context features. Results showed significant differences in overall recall performance between test conditions, indicating that context features of study episodes guided retrieval of motor sequences. In addition, the number of recalled items varied as a function of output position. Test context elements comprising context features of the first item set study episode were associated with initially lower but subsequently nearby stable recall performance, whereas test features comprising context elements of the second item set study episode were associated with initially higher and subsequently decreasing recall performance. This implies that a context reinstatement for list-1 items during the test phase does not immediately enhance accessibility of those items. However, access is subsequently facilitated over the course of retrieval attempts.

Response inhibition in the Negative Compatibility Effect in the absence of inhibitory stimulus features

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The Negative Compatibility Effect (NCE) is a reversal in priming effects that can occur when a masked arrow prime is followed by an arrow target at a long stimulus-onset asynchrony (SOA). To counter the explanation that the NCE is actually a positive priming effect elicited by mask features associated with the prime-opposed response, we devise masks that always point in the same direction as the prime, eliminating all antiprime features. We find large positive priming effects for arrow primes without masks and for arrow masks without primes. When a neutral mask is introduced, priming effects turn negative at long SOAs. In the critical case where the mask is an arrow in the same direction as the prime, the prime does not add to the positive priming effect from the mask, but instead strongly diminishes it. This feature-free inhibition is accompanied by a drop in response accuracy 280 ms after the target. No feature-free inhibition is seen when arrows are replaced by color stimuli. We conclude that even though response activation by stimulus features plays a major role in the NCE, there is a strong inhibitory component (though perhaps not in all feature domains) that is not based on visual features.

Maintenance of abstract quantity information and mechanisms of tactile rehearsal

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Evidence from recent working memory (WM) fMRI decoding studies converges on the view that the level of abstractness of a mental representation determines what brain regions code WM content. One assumes that contents represented in a sensory-like format (low level of abstraction) can be decoded from early sensory cortices, while more abstract content types (e.g. in multimodal, categorical, conceptual or language-like formats) can be decoded from higher order cortices. I will present a series of fMRI studies, which tested for WM codes when different types of abstract quantity information had to be retained, namely visual flicker, auditory flutter and vibrotactile frequency. When compared to WM of spatial layouts of tactile stimuli, we found a dissociation between posterior parietal (PPC) and prefrontal cortices (PFC) to exhibit content specific WM codes. Building on this, we explored the mechanism of attention-based refreshing – a type of rehearsal. In a delayed match-to-sample task, participants internally rehearsed sequences of spatial layouts or vibratory frequencies. We replicated the dissociation of PPC and PFC and found strong premotor cortex (PMC) activation during rehearsal of either stimulus type. To explore interactions between these regions we used dynamic causal modelling and found that activation within the network was best explained by a model in which the PMC drives activity in the content coding regions. Our results suggest that the PMC acts as a content-independent region that flexibly recruits content-specific regions to bring a WM item into the focus of attention.

Frontal theta and posterior alpha oscillations reflect the reactivation of visual working memory representations following interruptions

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In daily life situations, we often encounter interrupting secondary tasks and have to rely on working memory to keep track of the primary task that had been carried out. This talk will focus on the role of attentional control and working memory functions in the handling of such interruptions. Participants performed a continuous report working memory task with two randomly oriented bars presented to the left or right of fixation. In a subset of trials, this task was interrupted by a low-demanding or high-demanding arithmetic task. Following the interruption or an interval without interruption, a retroactive cue indicated the position of the stimulus whose orientation needed to be reported. Interruptions impaired the precision of orientation report and the probability to report the cued item, especially in the high-demanding condition. On the EEG level, we concentrated on the power of frontal theta oscillations (4-7 Hz) and hemispheric asymmetries of posterior alpha oscillations (8-14 Hz) following the retroactive cue. Theta power as a marker for attentional control was reduced when the retroactive cue followed an interrupting task compared to the condition without interruption, with the strongest decrease in the high-demanding condition. The suppression of alpha power contralateral to the side of the task-relevant bar stimuli served as a correlate for the orienting of attention towards the cued working memory item and was also reduced following the interruptions. These results show that interruptions reduce attentional control resources and impede the selective access to primary task information stored in visual working memory.

Decorative pictures as retrieval-enhancer of learning-relevant information

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Learning materials often consist of pictures that do not pursue a learning goal but an aesthetics function. Such decorative pictures were found to hinder learning by an increase of learning-irrelevant cognitive load (i.e., the seductive detail effect). Studies also showed that various details within a learning setting could have a retrieval-enhancing function when shown again in a retrieval phase (i.e., the memory cues effect). This talk is aimed to present results from an experimental series with four experiments (with more than 100 participants in each experiment) testing decorative pictures in a learning video on marketing concepts as memory cues. To reach this effect, one group achieved these decorative pictures again in their learning tests. All experiments showed that the seductive detail effect occurs when pictures were only shown in the learning videos. Besides, when decorative pictures are also used in the learning tests, learning results increased in comparison to a group without decorative pictures. Across the experiments, significant moderators (e.g., the salience of the cues, the associative connection between the cues and the learning information, and the modality of the cues) were found. Results can be partially explained by differences in additional measures on mental load, mental effort, and intrinsic motivation.

Efficient sampling using Randomized Response Techniques Part II: Sequential Probability Ratio Tests

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The Randomized Response Technique (RRT) enables researchers to assess sensitive attributes and test hypotheses on unknown prevalence rates while reducing social-desirability biases. Due to increased sampling variance, however, sufficiently powered hypothesis tests require extremely large sample sizes. Sequential designs such as curtailed sampling can help save resources by reducing the required sample sizes. Like conventional hypothesis tests, however, curtailed sampling is limited to the case of simple hypotheses. That is, all model parameters must be specified, which is not always possible. As a remedy, we propose sequential probability ratio tests (SPRTs) for hypothesis tests with the RRT. For simple hypotheses, the SPRT has been proven to be the most efficient sequential test. What is more, it can be extended to the case of composite hypotheses based on maximum likelihood theory. The resulting procedure does not depend on assumptions about unknown model parameters, reliably controls error probabilities, and requires on average up to 50% smaller samples than conventional hypothesis tests. We outline the general procedure and illustrate it with simulations and concrete examples.

Giving advice and personal colorectal cancer screening intentions

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When people turn 50 or 55 years, they become eligible for participation in the German colorectal cancer screening program. Physicians, insurances, and numerous campaigns aim to inform about colorectal cancer screening and to increase participation rates. When considering undergoing colorectal cancer screening, individuals often seek or give advice. This raises not only the question of whether screening intentions for oneself differ from advice given to others but also whether giving

advice influences subsequent personal screening intentions. In line with construal level theory, we propose that individuals give advice from a greater distance than when forming personal decisions. Making decisions for oneself (low social distance) is associated with low construal levels and relatively more weight of low-level attributes (= how aspects of the screening), whereas giving advice (high social distance) is associated with high construal levels and relatively more weight of high-level attributes (= why aspects of the screening). Hence, advisors should recommend undergoing colorectal cancer screening more often than involved actors would do. Thinking about the recommendation one has given, in turn, should increase construal levels, leading to higher subsequent personal screening intentions. Hypotheses were supported by comparing screening intentions from involved actors with recommendations and by comparing personal screening intentions with those after having given advice. Advisors recommended undergoing colorectal cancer screening more often than actors did. Recommending others to undergo colorectal cancer screening increased one's own intention to participate in the screening program. Underlying processes and implications for advice giving situations and actor-advisor differences are discussed.

Executive functions as predictors of digital stress

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Digital stress is caused by the use of digital technologies and media. Research on digital stress has so far mostly focused on adults at work, with only few experimental studies and little focus on cognitive competences as predictors. The current study focusses on digital overload as one relevant stressor. Overload means being overwhelmed with the quantity of digital input (e.g., too many mails/messages during important tasks). We suggest that successfully dealing with digital overload requires executive functions, such as inhibition of irrelevant information, shifting between tasks, and working memory capacity. We therefore examined whether these competences predict stress caused by overload. We assume that the better the performance in tasks measuring inhibition (Eriksen-Flanker-Fish task), shifting (Dot-Triangle-Task), and working memory (Digit-Span task) the less stress is experienced when confronted with digital overload. Digital overload was manipulated in a computer-assisted experiment. Students (18-35 years old) performed a basic reading test, consisting of 100 true or false statements that they had to judge for accuracy. In the experimental condition, during 39 sentences notifications from social media services (e.g., Whatsapp) appeared on the screen. In the control condition, no notifications appeared. Stress was indicated by heart rate variability and self-report. The data are currently being collected until the spring of 2021.

Attentional allocation in sensorimotor decision making reflects motor goal selection

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Neurophysiological and behavioral evidence suggests that in situations of target uncertainty, the brain simultaneously represents specifics of multiple potential actions before selecting one of them. Sensorimotor decisions, thus, might reflect competition between alternative actions that are held active in parallel. Here, we utilized the coupling between motor preparation and spatial attention to track how motor goal selection unfolds in situations of target uncertainty. We combined a delayed cueing paradigm, in which participants performed center-out reaches, with a covert spatial attention task. For the reaching task, two of multiple locations were pre-cued. After a delay, one of the pre-cued

locations was designated as the final movement goal, and participants initiated their reach. Following movement completion, participants reported the identity of a discrimination target presented at a variable time during the trial either located at the movement goal, the other pre-cued location, or any of the uncued locations. During the delay phase discrimination performance was enhanced at both pre-cued target locations, suggesting that they had been simultaneously attentionally selected. After final goal specification, discrimination performance further increased selectively at the movement goal. The peak of perceptual sensitivity was related to movement onset. Furthermore, we observed an earlier increase of perceptual sensitivity in trials with fast compared to slow reach initiation. These characteristics resemble the presumed integration of evidence during perceptual decisions; therefore, our findings suggest that attentional selection reflects not only the selection of a final movement goal, but also multiple movement alternatives and the competitive decision processes between them.

Charitable Giving under Normative Uncertainty: Experimental Evidence On The Behavioural Impact of Normative Expert Advice

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In this paper, we study donor behavior in decisions between charities that draw on fundamentally different normative claims. This decision under normative uncertainty has not been studied empirically before. Specifically, we investigate the willingness to pay for and the impact of expert advice on charitable giving. To study this question, we conducted an online experiment on a US sample of 709 participants. Participants were able to bid for descriptive information about the charities, for expert advice, or for both via a Becker-DeGroot-Marschak mechanism before being able to donate their earned endowment to one of the five charities. We find that expert advice by ethicists and economists significantly predicts both charitable donations and charity choice. Importantly, expert advice predicts charity choice and donations overall more strongly if it is paid for than if it is provided for free, a finding that is mirrored in the role that descriptive information plays. Further, we find that a gender effect on the impact of expert advice and descriptive information on uncertainty in that women report lower uncertainty after receiving some type expert advice or descriptive information, while men only report reduced uncertainty after receiving descriptive information. Overall, these results suggest that expert advice can have a substantial impact on donor's choice of charity and donation size in situations of normative uncertainty, suggesting actionable patterns potentially to be adapted by (meta-)charities.

Feature-response-translation as a prerequisite for observing binding effects when responding to visual stimuli

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Responding to a stimulus leads to the integration of stimulus and response features into a short episodic memory trace, known as an event file. Repeating any of its components leads to the retrieval of previously bound information, resulting in benefits for full repetitions, but interference for partial repetitions. According to action control theories, the resulting so-called “binding effects” underlie all simple actions. Yet, whereas such binding effects are reliably observed in target discrimination tasks, they are fully absent in visual detection and visual localization performance. Based on a number of conducted studies, as well as a vast body of attentional orienting and visual search literature, we propose a theoretical model with sequential architecture that can account for these findings. When participants signal the detection or location of a single visual stimulus, the response can occur directly

after identification of the target (i.e., based on its identified location); in turn, no binding effects emerge. When the response demands post-selectively processing the target after its identification - for example, the color, shape, or even its location feature - binding effects can be observed. Thus, a translation from a target-feature into the accompanying response is the crucial step for observing binding effects when responding to visual stimuli. This translational component allows to explain data patterns emerging in multiple experimental designs with a sequential structure.

Developing and Evaluating a Human-Machine Interface for the Remote Operation of Automated Vehicles (SAE 4 and 5)

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The automation of driving tasks is proceeding rapidly. However, for quite some time, highly and especially fully automated driving (SAE 4 and 5) may not be completely feasible from a technical perspective. In order to compensate for the shortcomings of technological progress, teleoperation may serve as a way to effectively use the benefits of automated driving while assuring safety and reliability contributed by a human operator. In the overwhelming majority of situations, this remote-operator will chiefly monitor the vehicles that drives automatically. In case of extraordinary events that exceed the capabilities of the automation, the remote-operator will take over control of the vehicle. In order to integrate the vehicle's automation and human remote-operation, the development of a user-centered human-machine interface (HMI) for teleoperation is crucial. Our development of an HMI is tailored to the remote-operation of a highly automated shuttle without an operator on board. The HMI is based on a systematic analysis of use cases, of which detailed requirements were derived. Subsequently, a paper-pencil prototype was generated and refined until a click-dummy emerged. This click-dummy was evaluated by control center professionals. The professionals were first presented the HMI in regular mode. Afterwards, they were asked to solve scenarios with disturbances in the system. Using thinking-aloud, structured interview and questionnaire methodology, the prototype was evaluated regarding its usability, situational awareness, acceptance, and perceived workload. Results support our HMI design for teleoperation of an automated shuttle and they provide insights for a refined HMI design as well as for further research.

Binding of Event Elements in Episodic Representations

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Experienced events consist of multiple elements such as persons, objects, and locations, which need to be bound together to represent the event in a coherent manner. Given such bindings, the likelihood of retrieving one event element should be related to the retrieval of another element from the same event. In a first experiment, we tested whether event elements are bound into an integrated structure, in which events are represented by a single engram, or into a hierarchical structure, in which elements are preferentially bound to one type of element. Participants learned word triplets consisting of an animal, an object, and a location, which were presented sequentially pairwise, and were later tested with a cued recognition task. We systematically excluded one of the possible pairwise associations in the learning phase within each experimental condition. An integrated binding structure predicts no differences in retrieval dependency between conditions, whereas a hierarchical structure does, since associations may vary in strength. Results favored a hierarchical binding structure with elements being preferentially bound to the item denoting an animal as the superordinate category. In a second

experiment, we test whether animacy drives the effects in the first experiment. Participants learn some events that involve an animated entity (animacy condition) and some events that do not (non-animacy condition). If animacy is responsible for the effect in the first experiment, the effect should be replicated in the animacy condition but should not occur in the non-animacy condition.

Contralateral delay activity, but not alpha lateralization, reflects gating in visual working memory

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Visual working memory (VWM) is inherently limited, making it important to select and maintain relevant information and to protect it from distraction by suppressing irrelevant, distracting information. Previous work has suggested the contralateral delay activity (CDA) and lateralized alpha oscillations (8–14 Hz) as neural candidates of such a gating process. While most of this work has focused on distraction during encoding, we investigated the effect of distraction during the maintenance interval. Participants ($n = 30$) encoded three lateralized targets in VWM and maintained these targets over a 3 sec delay. Half-way through the delay, distractors appeared briefly at the same location as the targets or in the opposite hemifield. Behavioral performance was most impaired by same-side distractors, less impaired by opposite-side distractors, and least impaired by weak, non-lateralized control distractors. In the pre-distraction interval, larger CDA amplitudes generally reflected better performance irrespective of the type of upcoming distraction. However, in the post-distraction interval and specifically after same-side distractors, larger CDA amplitudes were associated with stronger performance impairment, reflecting the disruptive influence of the distractor. By contrast, alpha lateralization was determined only by the location of the distractor, irrespective of the targets' location. Importantly, we found no association between alpha lateralization and mnemonic performance. Our findings suggest that the CDA indexes not only the maintenance of recently encoded targets, but also the gating of distraction during maintenance. By contrast, alpha lateralization only indexes the current focus of spatial attention with no role in VWM-related gating.

Cognitive Multitasking: Inhibition in Task Switching Depends on Stimulus Complexity

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We report a series of three experiments investigating inhibition in task switching, using N-2 repetition costs as an empirical marker. The experiments were structurally identical, employing a standard experimental paradigm where participants switch between three different categorization tasks. The experiments differed with respect to the stimulus material. According to prominent theories of cognitive control, N-2 repetition costs should be observed in all three experiments. To our surprise, this is not what we observed: N-2 repetition costs did not occur in Experiment 1, where we used static pictures from a driving simulator environment showing an oncoming car, embedded in a car-driving scene. In contrast, we observed robust N-2 repetition costs in Experiment 2, where we used static pictures of faces, and in Experiment 3, where the identical car stimuli from Experiment 1 were used, but without the surrounding visual scene. These results suggest that N-2 repetition costs depend on the complexity of the stimulus material. We discuss two aspects of complexity: 1) When the relevant stimulus feature is embedded in a complex visual scene, task-irrelevant features in that scene might trigger additional task sets, and thus induce additional task switches, attenuating N-2 repetition costs

among the instructed task sets. 2) The presence of distractors might lead to additional covert or overt shifts of spatial attention, which in turn might reduce the size of N-2 repetition costs. On a more general level, the results illustrate the difficulty of transferring laboratory tasks to settings that bear more similarity to everyday life situations.

By coincidence or by design? Experience-based choice anomalies are associated with pattern search

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People's exceptional ability to identify structure in a disordered, uncertain world is often taken as a hallmark feature of human cognition. Yet people search for patterns even in random sequences—a tendency that has been argued to give rise to several deviations from maximization in experience-based choice, including probability matching, underweighting of rare events, and negative recency. Thus, one view on behavioral phenomena that present as errors in experience-based choice is that they are associated with a cognitively sophisticated and ecologically adaptive search for patterns. An alternative view suggests that experience-based choice anomalies instead arise from cognitive constraints that motivate people to fall back on simpler strategies. To disentangle these opposing views, we conducted an experiment (N = 200) in which participants made experience-based decisions in standard probability learning and decisions-from-experience tasks (full feedback paradigm). We examined participants' decisions in both types of probabilistic tasks in relation to a) their ability to detect a fixed pattern in a decisions-from-experience task and b) individual differences in thinking style, intelligence, and working memory capacity. We found a curvilinear relationship between probability maximizing in standard probability learning and pattern accuracy in decisions-from-experience indicating that, compared to random choice and strict maximizing, approximate probability matching facilitated pattern identification in a different experience-based choice task. Moreover, we found a strong association between pattern accuracy and negative recency in standard decisions-from-experience. These results highlight that prominent experience-based choice anomalies are associated with people's tendency to discern whether outcomes occur by coincidence or by design.

Are simulations created incrementally during sentence comprehension?

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According to the experiential-simulations view of language comprehension (Zwaan & Madden, 2005), we comprehend the meaning of words by re-activating sensorimotor experiences that are associated with the word's referent. In the case of sentences it is assumed that the activated sensorimotor experiences are combined to yield a simulation that is consistent with the sentence meaning. In our future research, we will focus on the question whether these simulations are created incrementally. We will present participants with garden-path sentences (e.g., "While Eve walked the dog lay on the ground.") and unambiguous control sentences (e.g., "The dog lay on the ground while Eve walked."). Typically, comprehenders interpret the first verb of such garden-path sentences as being transitive and have to re-analyze the sentence when reaching the second verb. We want to figure out whether there are simulation effects reflecting the initial interpretation. In each experimental trial, our participants will read either a garden-path sentence or a control sentence. Subsequently, they will see a picture of the target entity that matches either the initial or the final interpretation during garden-path processing (e.g., a walking vs. a lying dog). The task will be to judge whether the depicted entity was mentioned in the sentence. If comprehenders create incremental simulations, both entity

interpretations should be available after reading garden-path sentences (but not after reading control sentences). Hence, we hypothesize that participants will respond relatively faster to pictures that match the initial entity interpretation after reading garden-path sentences than after reading control sentences.

Motor plan retention requires working memory resources

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Previous studies found a disruptive effect of motor plan retention and execution on working memory (WM). Here, we wanted to differentiate between both processes and to test whether motor plans were retained between two subsequent executions of a similar movement (motor hysteresis). We expected the same disruptive effect in trials with retention and execution and in hysteresis trials, but a smaller disruptive effect in trials with retention only (i.e., no-go trials). In three experiments, participants executed a baseline WM task, a WM task plus a concurrent motor task that required motor plan retention and execution (80% of trials) or retention only (no-go, 20% of trials), and a WM task plus a concurrent hysteresis task. A repeated measures ANOVA on recall performance showed a significant main effect of 'task', $F(3,75) = 39.484$, $p < .001$, $\eta^2p = .612$, indicating that motor processes depleted WM resources. Planned comparisons showed a significant decline in recall performance (17.9% = effect of retention) from baseline to the no-go task, $t(25) = 5.522$, $p < .001$, $d = 1.083$, and an additional decline from the no-go to the execution task (13.3% = effect of execution), $t(25) = 4.486$, $p < .001$, $d = 0.880$. Retention and execution had an isolated, disruptive effect on WM. Results did not show a significant difference between the retention and execution task and the hysteresis task, $t(25) = -0.624$, $p = 0.538$, $d = -0.122$, indicating that motor plans are retained between two executions of a similar movement.

Dissociating hemispheric- from effector-specific repetition effects in action selection

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Action choices are influenced by future and recent past action states. For example, when performing two actions in succession, response times (RT) to initiate the second action are reduced when the same hand is used. These findings suggest the existence of effector-specific representations for action selection. However, given that each hand is primarily controlled by the contralateral hemisphere, the RT benefit might actually reflect body side/ hemispheric-specific rather than effector-specific repetition effects. Here, participants performed movements with either (i.e., left, right) hand or foot in one of two directions; direction instructions were specified anatomically ("inward, outward") or externally ("left, right"). Successive actions were initiated faster when the same effector was repeated (e.g., left hand – left hand), even when those actions involved different movement directions, whether specified anatomically or externally. Conversely, repeatedly using the same body side did not yield an RT benefit (e.g., left foot – left hand). Our finding, thus, lend support to the claim that repetition effects in action selection arise at the level of individual effectors.

A large single-participant fMRI dataset for probing brain responses to naturalistic stimuli in space and time

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We recorded a densely sampled large functional magnetic resonance (fMRI) dataset in a single individual exposed to spatio-temporal visual and auditory naturalistic stimuli (BBC's Doctor Who). The data consists of approximately 120,000 whole-brain volumes (approx. 23 hours) of stimuli presented once and approximately 500 volumes of narrative short movies, repeated 26 times. The recording was motivated by the goal to train modern convolutional neural networks end-to-end on human sensory data, which, due to a lack of sufficiently large datasets had not been possible before. This rich sensory data set has been made publicly available to benefit other areas of cognitive neuroscience.

Following our goal with the recording, we proceeded to train a convolutional neural network directly from this data, with layers corresponding to visual regions of interest, and its architecture describing a simplified model of the visual system. In this end-to-end training the sole objective was to correctly predict brain activity given input stimuli. Using an image-generating neural network together with this trained model of the visual system we derived images that maximally activated regions such as PPA and FFA inside the model (in-silico). This explorative approach enables forming new hypotheses about functions of specific areas in sensory systems.

Contextual vs. probabilistic learning of target-scene associations differentially facilitate retrieval and attentional orienting in real-world scenes

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When navigating our surroundings, environmental regularities can efficiently guide our behaviour. This knowledge of probable target locations can be acquired via hippocampal-dependent spatial-contextual associations (CC, contextual-cueing) or striatal-based probabilistic regularities (LPL, location probability learning). Here, we tested how these learning systems aid the utilization of established memories. In two online experiments, participants first learned to associate targets with either a specific scene location (CC) or a visual hemifield (LPL) within the same visual search task. In Experiment 1, participants were subsequently tested on their memory for the hemifield and the specific spatial location of the learned targets. After both LPL and CC, participants showed enhanced recall accuracy for target hemifield and specific target location. However, when learning performance was low (low accuracy/high reaction time), predominantly LPL facilitated memory for target hemifields, and when learning performance was high CC facilitated memory for specific target locations. In Experiment 2, participants were tested on their ability to attentionally orient to targets flashed either in a learned specific location or hemifield. We found greater orienting benefits for CC compared to LPL. Together, we demonstrate that contextual and probabilistic learning systems provide utility for future retrieval of learned associations, but how these systems promote memory retrieval may be related to the quality of encoding. Further, attentional orienting seems more profoundly guided by contextual, compared to probabilistic regularities. Our work suggests that a more nuanced view of how these memory systems cooperate and/or compete to guide adaptive behavior is necessary.

How alertness modulates congruency effects in the flanker task depends on stimulus salience

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Various studies have shown that alertness amplifies congruency effects in conflicts tasks such as the flanker task. Some researchers have argued that this alertness-congruency interaction arises because alertness biases attention towards salient stimuli. In two experiments, I tested this account in the context of the flanker task by varying both alertness and stimulus salience. In Experiment 1 (arrow flanker task), participants were asked to respond to the orientation of a target arrow that was surrounded by four flanker arrows of the same (compatible) or the opposite (incompatible) orientation. Alertness was varied by presenting an auditory alerting signal (AS) before the flanker display in half of the trials. Stimulus salience was varied by blurring either the target or the flankers. In Experiment 2 (letter flanker task), letters instead of arrows were used as stimuli, and only one compatible (incompatible) flanker was presented in the display. Stimulus salience was varied via letter size. As expected, Experiment 1 revealed a larger congruency effect in trials with AS than in trials without AS. Importantly, however, this alertness-congruency interaction was observed only in case the flankers were more salient than the target. Experiment 2 furthermore revealed a reversed alertness-congruency interaction (i.e., a smaller congruency effect in trials with AS) in case the target was more salient than the flanker. Together, these results show that stimulus salience indeed determines whether alertness amplifies congruency effects in the flanker task or not.

The role of distance in binding responses

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Responding to a stimulus leads to the integration of stimulus and response features into an event representation (event file). Consequently, repeating one of these features retrieves the whole event file, influencing further responding. Recently it has been shown that the same mechanisms of binding and retrieval can also affect multiple responses: Executing two individually planned responses in sequence leads to integration of them so that repeating one of the responses later on retrieves the other (Moeller & Frings, 2019). While factors modulating binding and retrieval between stimuli and responses are well researched, this is not the case for bindings between responses. According to Frings and Spence (2013), hand distance influences binding between tactile stimuli applied to the participants' hands. Here we investigated whether hand distance also affects binding between responses. To be integrated responses were always executed with different hands and distance between the hands (close vs. far) was varied in two conditions. First data seems to suggest larger binding effects for responses positioned close together than for responses positioned far apart.

Development of multisensory integration following prolonged early-onset visual deprivation

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Adult humans integrate multisensory signals effortlessly and often in an optimal fashion. This remarkable ability takes years for normally-sighted children to develop. Hence it is questionable whether a person born blind or with extremely low vision would still be able to develop multisensory integration later in life when surgically treated for sight restoration. The delayed development of such integration abilities would be a key example for the human brain retaining a great level of plasticity even in the absence of structured multisensory input for years. In two experiments we investigated the developmental path for multisensory integration in individuals suffering from congenital bilateral dense cataract who were surgically treated years later. In Experiment 1 we assessed whether the restored visual abilities could bias size estimation for an object simultaneously explored by touch. We found that quickly after surgery (within days to months) cataract-treated individuals developed a multisensory weighting behaviour sometime even similar to matched healthy controls. These findings indicate that cataract-treated individuals use vision together with touch. However, to confirm that vision is truly integrated with touch for estimating size, in Experiment 2 we demonstrated that the benefit of integration—the increase in estimate precision—develops from experience within months to years after surgery from levels that are clearly suboptimal to in some cases performance indistinguishable from optimal behaviour. Thus, multisensory integration can still develop after years of deprivation. Crucially, optimal integration is not merely a reflection of maturation evolving with age, but requires years of sensory experience with the world.

The role of awareness in processing ensemble statistics

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Our rich perceptual experience can be partly explained by processing ensemble statistics (Cohen, Dennet, & Kanwisher, 2016). Ensemble statistics computation is the ability of our visual system to quickly compute summary statistics for groups of objects, e.g., the mean size of a set of circles (Ariely, 2001). Ensemble processing is robust to many limitations: it is automatic (Oriet and Brand, 2013) and does not require attention (Alvarez & Oliva, 2008, 2009). However, it is unknown whether ensemble statistics are computed when the ensemble is presented without awareness.

In the present study, we tested the hypothesis that invisible ensemble statistics have a priming effect on individual stimuli. The participants were presented with a masked ensemble of oriented grating stimuli and were then asked to report whether a singular grating stimulus was tilted to the right or to the left. The singular grating had either the mean orientation of the ensemble, one of the members' orientations, or a non-member orientation. We manipulated the stimulus-onset asynchrony (SOA) between the masks and the ensemble: when the SOA was 160 ms, the ensemble was easily detected. When the SOA was 0 ms, the ensemble was hard to detect, although detection performance was still above chance.

The results show a main effect of the test orientation: when the test stimulus had the mean orientation of the ensemble, the reaction times were lowest, they were higher for the member orientation and highest for the non-members. The results show the priming effect of ensembles that is modulated by masking.

Crossmodal interactions in Various Forms of Sensory/Perceptual Learning

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Until recently, perceptual learning had been studied exclusively in unisensory settings. I argue that learning and memory should be studied in multisensory settings whenever possible because that is generally the *modus operandi* of these systems, and the condition for which our memory and learning systems have been evolved. By studying these systems in unisensory conditions, we may be probing the system in a suboptimal mode of processing, and may fail to capture important properties of these mechanisms.

Crossmodal interactions play an important role in various types of learning. I will review results that show multisensory experience enhances and accelerates unisensory perceptual learning, it instantaneously recalibrates unisensory representations, and improves unisensory episodic memory. These findings show that crossmodal interactions not only affect perception when signals from multiple modalities are present, but also influence the subsequent unisensory processing. In fact, our recent findings show that in some cases, crossmodal interactions can aid learning even in the absence of multisensory experience: training in auditory modality produced substantial visual learning where visual training failed to produce any significant learning. In other words, outsourcing the training to a different modality was key to learning. I will discuss the variety of ways in which crossmodal interactions can benefit learning and memory. I will also present a computational characterization of the influence of multisensory experience/adaptation on sensory processing.

Altogether, these findings suggest that crossmodal interactions influence both multisensory and unisensory memory and learning in a robust and rapid fashion.

Personalized cognitive training: individual-level meta-analysis implementing machine learning methods

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Cognitive training comprises a class of relatively new therapeutic interventions, which target cognitive mechanisms underlying different mental health conditions. Cognitive training involves practice or modification of a given cognitive function, such as executive attention or control, with the aim of making this function more efficient or more benign. Extensive research supports the potential of cognitive enhancement methods to promote wellbeing and emotional functions. However, questions remain regarding efficacy and generalizability. Previous studies suggest that certain subgroups may benefit more from cognitive training, compared to other subgroups. While inconsistent outcomes across the field may arise from individual differences in response to training, few investigations examined possible moderators associated with individual differences in training outcomes.

With the aim of promoting personalized cognitive training regimes we collected twenty-six cognitive training datasets, comprising 1,942 participants. Datasets incorporated diverse training regimes which differed in training characteristics such as the targeted domain (e.g., working memory training, attentional bias modification, interpretation bias modification, inhibitory control training); whereas participants differed in diagnostic status (anxiety disorders, depression, healthy), age, sex and country of residence. Machine learning algorithms designed to identify individuals most responsive to cognitive training in general and to discern which methods may be a better fit for certain individuals were implemented.

Methodological aspects which facilitated this comprehensive analysis, as well as preliminary outcomes, will be presented.

Investigating the neural substrates of episodic memory updating based on new sequential and semantic information – evidence from an fMRI study

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Episodic memories are understood as scenarios of the past that we generate by enriching existing memory traces, which entail information about an episode's sequential structure, with semantic information. However, such episodic memories are not exact copies of past experiences, but they are updated on the basis of new relevant information to allow us to maintain valid predictions. In the present study, we aimed at investigating the neural bases of memory updating based on both components in scenario generation. We used functional magnetic resonance imaging (fMRI) and presented modified videos of before encoded episodes to violate expectations and thus induce prediction errors that lead to internal model updating. Videos were modified with respect to the sequential structure of an episode (switching of action steps) or semantic information (exchange of an object). While brain activity triggered by conflicting sequential information reflected increased processing of alternative competing action steps and the location of the self in past episodes, brain activity elicited by conflicting semantic information represented the integration of new object information into existing models. As expected, we found an attenuation of brain activity with repeated exposure to the same modified videos which was more pronounced in the sequential than in the semantic violation condition. This finding indicates that the brain more readily adapts the order of action steps in episodes than their semantic content. In conclusion, our study provides valuable new insights into the neural bases of internal model updating within the framework of episodic memories.

Is the meaning of fluency learned or inherently positive? A

Pseudocontingencies test.

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Fluency is the experienced ease of ongoing mental operations. This experience increases the subjective positivity of stimuli attributes, such as beauty, truth, or trustworthiness. This suggests that fluency is an inherently positive experience. Alternatively, fluency may be a neutral experience and its interpretation depends on learned contingencies within a judgment context. Within this latter perspective, a question is how individuals acquire the meanings they attribute to fluency. Here, we test pseudocontingencies (PCs) as a mechanism that might explain how people learn the interpretation of fluency. PCs are the inference of illusory correlations between two attributes due to the observation of their jointly, albeit uncorrelated, skewed base rates; that is, people related what is frequent in one attribute to what is frequent in the other. We used the context of online markets, which should be conducive of PCs: Most evaluations are positive, and most seller names are fluent. We manipulated the base rates of the name fluency and the reputation of online sellers, creating conditions for participants to infer either positive (when the two attributes' base rates were skewed in the same direction, e.g., high fluency name – good reputation sellers) or negative (when the two attributes' base rates were skewed in opposite directions, e.g., high fluency name – bad reputation sellers) PCs between name fluency and seller reputation. Contrary to the predictions of fluency's malleability

hypothesis, negative PCs did not emerge. We discuss the implications of these findings for the debate regarding fluency's nature as a positive vs. malleable experience.

Disentangling the effect of working memory load on different postural subsystems

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In daily life, maintaining postural balance in an upright position seems to be a highly practised task that is executed more or less automatically without the requirement for additional cognitive resources. However, some studies employing motor-cognitive dual-task (DT) paradigms indicate that additional cognitive demands can affect postural control in the elderly as well as in younger adults. This can be shown, for example, by decreased postural stability or an increased risk for falls under DT compared to single-task conditions. Although maintaining balance requires the processing and integration of multiple types of sensory input, in most of the studies in the field, however, postural control is operationalized as a single product measure without considering the interplay of different postural subsystems. In the current study, thus, our aim was to disentangle the effect of cognitive load on these subsystems. For this purpose, while participants were instructed to keep their balance on a force platform we progressively reduced sensory input in order to identify the influence of different postural subsystems (visual, peripheral-vestibular, somatosensory, cerebellar, nigrostriatal). Participants executed this balance task under single-task and DT conditions. For the latter, we concurrently applied an auditory working memory updating task. As a result, we found distinct effects of working memory load on the different postural subsystems. Our findings will be discussed in the context of shared resources between cognitive and motor-related domains in multitasking situations.

The distinctiveness of neural information representation at the category and item level relates to memory performance in younger and older adults

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The dedifferentiation hypothesis states that reduced distinctiveness of neural representations underlies age-related cognitive decline. Computational models suggest deteriorated neural representation at the level of individual items, but previous studies mostly investigated age differences in category-level representations. In an age-comparative fMRI study, we used univariate analyses and multivariate whole-brain pattern similarity analyses to examine neural dedifferentiation across representational levels in relation to memory performance. Thirty-five younger adults (18–27 years old) and 32 older adults (67–75 years old) performed an incidental encoding task comprising images of faces and houses, and a subsequent old/new recognition memory task. We show that univariate category selectivity in the ventral visual cortex is reduced in older adults and related to memory performance across participants. Furthermore, multivariate pattern similarity analyses also revealed age differences in category-selective regions, but there was no relation to memory performance. Finally, we identified additional age differences in item-level specificity in occipital regions that were driven by reduced item stability in older adults. Importantly, item stability – the pattern similarity between first and repeated item presentation – was higher for subsequently remembered items than

for not remembered items. Overall, we show that differences in representational distinctiveness coexist across representational levels and jointly contribute to interindividual and intraindividual variability in memory success.

Applications of the the crossmodal and multisensory self-prioritization effect

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In this presentation, we review the evidence concerning the representation of the self in each of the senses, as well as in a multisensory / cross-modal context. We consider how the self-prioritization effect (SPE) can be, and in some cases already has been, intuitively used by marketers / advertisers in order to increase the perceived value of products.

The SPE has been demonstrated in the visual, auditory, and tactile modalities (Schäfer, Wesslein, Spence, Wentura, & Frings, 2016), and both crossmodal and multisensory variants of the audiovisual SPE have now also been documented (Schäfer, Wesslein, Spence, & Frings, 2021). In due course, the SPE will presumably be shown with chemosensory stimuli too (e.g., “This perfume is your scent.”). In this talk, we will take a closer look at the crossmodal and multisensory variants of the SPE and consider some of the ways in which marketers may intuitively have picked-up on certain of the information processing benefits of the SPE. One might, for example, consider the use of a first-person perspective or the presentation (or appearance) of stimuli in peripersonal space in advertisements/product placement as operating in just this space. Similarly everything from Starbucks scrawling your name on the coffee cup, though to the suggestion that hot beverages taste better from your own cup (Spence, 2017) can also potentially be recast as providing real-world examples of the benefits of self-prioritization.

Dealing with undesired motor automatisms: What EEG can tell us about the cognitive processes underlying successful interference control

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When changing pre-existing motor skills strong automatisms often trigger behavior that is highly dominant but may be counterproductive under new conditions. In case of an arising response conflict, interference control is a crucial function to solve this conflict and execute the desired action. Despite its practical relevance, there is little knowledge about the cognitive and neuronal mechanisms underlying motor skill change. It is assumed that interference control is tightly interconnected with inhibitory functions. In the motor domain, especially prepotent response inhibition (one subdimensions of inhibition) seems to be particularly relevant for successful interference control. Recent evidence suggests that different inhibition subdimensions are reflected by distinct, characteristic ERP pattern including larger P3 components for response inhibition. The aim of the present study was to investigate whether a related ERP pattern could be observed in a task that required to deal with interference from strong motor automatisms (indicating the involvement of response inhibition). To this end, we experimentally induced interference in the highly automatized motor skill of typing by applying a letter switch manipulation which is known to generate strong and immediate interference costs. Indeed, the presence of interference was observable in strongly increased typing times and errors. Most importantly, stimulus-locked ERP analyses revealed the

hypothesized ERP pattern, that is enhanced P3 components at frontal, central and most pronouncedly parietal sites for trials of successful interference control. Together, this study provides first insights into the electrophysiological correlates of motor skill change, corroborating the pivotal role of response inhibition for successful interference control.

Using the multilingual mental lexicon: Structural vs. contextual effects

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A prominent model of late bilingualism, the Revised Hierarchical Model (Kroll & Stewart, 1994), postulates bidirectional but asymmetrical connections between separate lexical stores for L1 (native language) and L2 (second/foreign language). These lexicons share a language-independent conceptual store, which is assumed to be involved when translating into the foreign language, but not (or at least less) when translating into the native language, resulting in different preferred mental routes and specific performance asymmetries between the two languages. Previously, we confirmed the model predictions in a bilingual experiment comparing both translation and picture naming tasks for German native speakers with advanced English proficiency. Next, we repeated the same experimental paradigm with 24 non-native speakers, who spoke both German and English fairly fluently. Surprisingly, they showed comparable translation asymmetry and category effects to the German native speakers, even though their own native languages were not relevant to the experiment, and most had learnt German later (MAoA = 16.5, SD = 6.22) than English (MAoA = 8.2, SD = 3.83). These findings suggest that performance asymmetries in multilingual language use may not only depend on structural properties but also on which language is currently highlighted by the experimental and general language context.

Rewards and performance errors bias voluntary task choices

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Humans adapt their behavior to current demands flexibly. It has been suggested that the decision which of multiple task options to engage with is based on a tradeoff between rewards and costs associated with each task option, with the aim of selecting the task with the highest expected value. However, an experiment that directly tests whether and how the interplay of rewards and performance costs influence task choices is missing. The present research project was conducted to test this hypothesis. Participants were exposed with a two-stage voluntary task switching paradigm, with a task selection stage and a task execution stage. Rewards were provided after the task selection and were thus independent of participants' task response. The reward gained for the performed task gradually decreased while the reward associated for the alternative task was not altered. Results suggested that participants' probability to switch to the alternative task was influenced by reward differences with increasing differences in favor of the alternative task leading to higher switch rates. In addition, task choices were influenced by performance errors with an increased probability to switch tasks after an error on the previous trial. Finally, results suggested that task difficulty further modulated the effect of reward and errors in n-1, with highest switch rates after errors and more rewards on the task alternative when this alternative task was easier. We conclude that voluntary task choices depend on both reward and performance with task selections in favor of the task with the highest expected value.

Reaktionen menschlicher Fahrer auf hochautomatisierte Fahrzeuge im Erstkontakt auf der Autobahn

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In naher Zukunft werden neben menschlichen Fahrern auch hochautomatisierte Fahrzeuge (SAE Level 3) auf der Autobahn unterwegs sein. Daraus resultiert ein Mischverkehr, in dem menschliche Fahrer diesen Fahrzeugen zunehmend begegnen. Bislang ist jedoch unklar, ob menschliche Fahrer automatisierte Fahrzeuge von außen überhaupt von anderen menschlichen Fahrern unterscheiden können und wie menschliche Fahrer auf diese Fahrzeuge im Erstkontakt reagieren. Um diese Forschungsfragen zu beantworten, wurde eine Fahrsimulatorstudie durchgeführt, bei der menschliche Fahrer in vier ausgewählten Autobahnsszenarien entweder einem hochautomatisierten Fahrzeug oder einem anderen menschlichen Fahrer begegneten. Die Auswahl der Fahrszenarien wurde auf Basis von Interviews mit N = 9 Experten aus Industrie und universitärem Bereich getroffen. Zusätzlich wurde die Wirkung der Kennzeichnung des hochautomatisierten Fahrmodus mittels Statusanzeige nach außen untersucht (keine Kennzeichnung, richtige Kennzeichnung, falsche Kennzeichnung). An der Studie nahmen N = 51 Probanden im Alter von 20 bis 71 Jahren (22 weiblich) teil. Die Probanden bewerteten jede Begegnung mit einem Zielfahrzeug hinsichtlich subjektiver Sicherheit. Bei den erhobenen Fahrdaten wurden insbesondere (minimale) Sekundenabstände zu den Zielfahrzeugen ausgewertet.

Die Ergebnisse zeigen, dass es aus der Außenperspektive menschlicher Fahrer im Mischverkehr möglich ist, hochautomatisierte Fahrzeuge anhand ihres Fahrverhaltens von anderen menschlichen Fahrern zu unterscheiden. Jedoch erschwerte eine nichtzutreffende Kennzeichnung diese Unterscheidung. Eine Kennzeichnung nach außen sollte dementsprechend stets mit dem aktuellen Fahrmodus übereinstimmen. Insgesamt bewerteten Probanden die Begegnungen mit hochautomatisierten Fahrzeugen nicht wesentlich risikoreicher und unangenehmer als Begegnungen mit anderen menschlichen Fahrern. Dennoch führte das streng regelkonforme Fahrverhalten automatisierter Fahrzeuge situationsspezifisch zu einem Gefährdungspotenzial für menschliche Fahrer im Mischverkehr.

Suppressing signals: the competition of goal-driven and stimuli-driven attentional control in the presence of threatening stimuli

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There are contradictory findings about the prioritizing of threatening objects in tasks that use multiple stimuli competing for attentional resources. Theories of attention suggest that orientation is the result of goal-driven and stimulus-driven perception. The stimulus-driven bottom-up and goal-driven top-down neural mechanisms interact, biasing this competition. This bias can be modulated by different stimulus attributes, like affective valence. The signal suppression hypothesis of controlled attention capture claims that the signal of a salient stimulus can be suppressed by top-down control before the bottom-up processing could start. That is, the top-down control actively suppresses the stimulus-driven processing in favor of the goal-driven processing for better performance. In the present behavioral and eye-tracking study, participants had to find an exemplar of a neural category (eg. butterflies or locks, ie. target) among several other neutral objects of different category. In half of the tasks, there was either a threatening object (snake or gun) or a non-threatening but visually similar object (hairdryer or worm) in different distances to the target. Our findings suggest that bottom-up mechanisms can be suppressed by top-down mechanism for better task-performance and the prioritizing of threatening stimulus can somewhat be repressed.

Same same but different? Comparing the Sequential Probability Ratio Test and the Sequential Bayes Factor Test

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Resources in research are limited. For many researchers, it is therefore important to strike a balance between efficiency and informativeness in experimental designs. Sequential hypothesis tests optimize this balance by allowing researchers to stop the data collection process as soon as sufficient evidence about the tested hypotheses has been obtained. Recently, two sequential hypothesis testing procedures have been proposed for the use in psychological research: The Sequential Probability Ratio Test (SPRT) and the Sequential Bayes Factor Test (SBFT). We show that even though the two methods have been presented as distinct methodologies in the past, they can be regarded as two instances of the same overarching hypothesis testing framework. We demonstrate that the two methods use the same mechanisms for evidence monitoring and error control, and that differences in efficiency depend on the exact model specification as well as on the true data generating process. Based on these results, we argue that previous comparisons between the SPRT and SBFT have overestimated their difference in test efficiency due to misaligned comparison settings. Therefore, we recommend that researchers choosing to apply the SPRT or SBFT to their research should not solely focus on the efficiency of the design, but also question whether the test fulfills other desiderata, such as providing strong evidence or making realistic model predictions. Based on their situation-specific evaluation of these characteristics, researchers can configure the sequential hypothesis test to their needs within the unified sequential testing framework of SPRT and SBFT.

Increasing complexity: from single-tasks to triple-tasks

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Current multi-tasking research is approached from two perspectives: basic experimental psychology using extremely simple paradigms (ESP) and applied human-computer interaction using hypercomplex simulators. The conceptual gap between both fields is huge and there have been no structural attempts at joining these approaches. Transferring knowledge from ESPs to simulator tasks, such as flying an airplane, is difficult because it is unknown whether insights generated from simple dual-tasks can be extrapolated to hypercomplex triple-, quadruple- or even multiple-tasks. An attempt to start bridging this gap, we are the first to extend classical dual-task paradigms by a third task. The goal was to investigate whether the cost of adding tasks (in terms of response times or accuracies) scales linearly from single tasks to more complex tasks. Such an inference is only possible by adding a third task to the dual-task paradigm. In the present study, we conducted two experiments. Participants had to respond in a single-task, dual-task (only E2) or triple-task to either a location, color or pitch stimulus with their foot, hand or voice. We were able to observe two significant results. First, and in contrast to the existing dual-task research, the costs with the response modality hand are lower than with the foot. Second, due to a complex interaction of stimuli and response modality, the response behavior for triple-tasks cannot be easily extrapolated from single and dual-tasks (no clear linearity). Therefore, it is important to pay further attention to triple- and multiple-tasks if we want to better provide multi-tasking in complex situations.

The Interrelation Between Illusory Crescents and Perceived Bouncing/Streaming: An Individual Differences Approach

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Establishing correspondence between individual views of objects over time and motion is important for effectively interacting with the surrounding environment. In visually ambiguous situations, cross-modal cues can alter visual object correspondence. A good example of such an ambiguity is the bouncing/streaming display, in which two identical discs move horizontally toward each other, overlap in the center of the screen, and then move apart again. While this display can be interpreted either as two discs bouncing off or streaming past each other, observers are more likely to report bouncing impressions when a brief tone coincides with the moment of overlap (auditory-induced bouncing). One potential perceptual explanation for this phenomenon is that observers perceive less overlap between the moving discs when a tone coincides with the moment of overlap than when the visual display is presented alone (auditory-induced illusory crescent). In the present project, we conducted an individual differences approach in order to study the interrelation between auditory-induced illusory crescents and auditory-induced bouncing. Each participant completed the bouncing/streaming task and the illusory crescent task twice on two consecutive days. Both tasks measured individual differences reliably. We observed substantial correlations between the illusions induced by the coinciding tones of less reported overlap between the moving discs and more reported bouncing impressions. These results show that auditory-induced illusory crescents and auditory-induced bouncing are related phenomena. Future research is necessary to evaluate whether this relationship is causal or whether it arises from a common relationship to subordinated perceptual processes.

Stimulus pairing relates to infant's success in the looking-while-listening paradigm

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Work with the looking-while-listening paradigm suggested that six-month-old English-learning infants associated several common nouns with pictures of their referents. This was evidenced by systematic fixations towards a target picture (while one distractor picture was present) named by either infants' caregiver (Bergelson & Swingley, 2012, PNAS) or by an unfamiliar talker (Bergelson & Swingley, 2018, Child Development). However, Norwegian-learning infants did not systematically fixate target pictures named by an unfamiliar speaker until they were 8 to 9 months old. Moreover, their success in this task appeared to be modulated by aspects of stimulus pairing, specifically frequency differences between target and distractor: High (resp. low) frequent targets attracted more fixations if they were paired with low (resp. high) frequent distractors (Kartushina & Mayor, 2019, Royal Society Open Science). In the present eye-tracking study, we tested 49 monolingual German infants aged four to 14 months by means of a looking-while-listening paradigm. Infants saw two pictures side-by-side on a screen, whilst an unfamiliar male talker named one of both. Overall, infants did not fixate the target picture more than the distractor picture (Bayes factor in support of the null effect with anecdotal to moderate evidence). In line with previous results, infants' performance on the task was higher when the target and distractor word differed within their word frequency. Therefore, our results further emphasize cross-linguistic differences in early word learning and strengthen the view that infants might use extra-linguistic cues within the stimulus pairing, such as frequency imbalance, to disambiguate between two potential referents.

Individuating outgroup faces: Investigating the cognitive processes underlying individuation versus categorization

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Ingroup faces are usually individuated, whereas outgroup faces are processed categorically, but the cognitive processes underlying individuation vs. categorization are still poorly understood. The present eye-tracking study investigated how individuation instructions alter visual attention while White participants completed a recognition task with White (i.e., ingroup) and Middle Eastern (i.e., outgroup) faces. One group of participants ($n = 58$) was instructed to attend to individuating features of outgroup faces; a control group ($n = 46$) received no such instructions. Overall, recognition was better for ingroup compared to outgroup faces (i.e., an other-race effect), but individuation instructions diminished this effect. Further, individuation instructions lead to more fixations for outgroup faces. Different to previous research, individuation instructions did not affect attention to the eyes. Finally, analyses of pupil sizes revealed that ingroup and outgroup faces received equal amounts of cognitive effort under individuation instructions. We conclude that individuation instructions alter visual attention and recognition, and we discuss potential avenues for future research.

The Impact of postural control on congruency effects

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In the current study we investigated the effects of postural control on cognitive control processes in task switching. The study was conducted using cued auditory-manual task switching under different postural control demands (sitting vs. standing and sitting vs. standing vs. lying). This design allowed us to explore the effect of postural control on switch costs, mixing costs and the between-task congruency effects. We replicated these standard effects in task switching in all experiments. Importantly, we demonstrated a selective effect of postural control demands in task switching in terms of an increased congruency effect when standing as compared to sitting and lying. Our findings suggest that particularly in situations that require keeping two tasks active in parallel, the postural control demands have an influence on the degree to which cognitive control enforces a more serial (shielded) mode. Our results will also be discussed considering event-related analyses of postural control performance in terms of biomechanical characteristics.

Are Vegetarians Better People? Nutritional Behavior as a Possible Source of Moral Licensing.

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The phenomenon of moral licensing was discovered and described two decades ago by Monin & Miller (2001). In contrast to classical consistency theories the model suggests that initial moral behavior can create a license for subsequent immoral actions, instead of increasing the likelihood of further moral actions. Since recent research (e. g. Simbrunner & Schlegelmilch, 2017) cannot conclusively answer the question which circumstances promote the occurrence of either effect, we started a semi-experimental study in order to contribute to this unresolved research question. We conducted an online survey with 332 participants who were categorized into four groups, based on the perceived moral status of their nutritional behavior:

Meat eaters, flexitarians, vegetarians, and vegans (in ascending order of the moral status of their diet). We expected that vegetarians and vegans might feel to be licensed for immoral actions (e. g. willingness to travel without paying for the ticket; unwillingness to donate money to charity) to a higher degree than meat eaters and flexitarians. However, we could not find any differences in these immoral action tendencies between the four groups.

The discussion of possible reasons why the moral licensing effect failed to materialize in the domain of nutritional behavior will focus on three issues: (1) measurement of immoral behavior; (2) strong commitment of vegetarians and vegans towards their goals which might lead to consistent moral behavior (Susewind & Hölzl, 2014); (3) cultural differences in Individualism vs. Collectivism (Hofstede, 2001).

Humans retain a representation of information acquired across fixations

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Humans execute multiple saccades every second to sample information from the environment, creating complex scanpaths across many objects and locations. There is divergent evidence as to whether humans are aware of the locations and objects they have fixated across these sequences of saccades. Instead of explicitly asking participants to report the locations or objects of their fixations, we used a measure of perceptual confidence to investigate whether people know how much information they have about objects in the world. If people retain a representation of how much information they have acquired about objects across fixations, there should be a link between fixations, perceptual confidence and perceptual performance.

Participants viewed an array of five real-world, everyday objects, presented at a random angle from 360° of possible viewpoints. After 1500ms, participants were asked to choose two objects from a list to make a perceptual report on: choice was a proxy for perceptual confidence. Participants then made a perceptual report by rotating a presented object to match the remembered viewpoint.

Participants were more likely to choose fixated objects, and they reported the orientation of these objects more accurately than non-chosen or non-fixated objects. This demonstrates they had more perceptual confidence for items they had more information about. Participants additionally considered the inherent perceptual value (report difficulty) of the heterogeneous objects, and chose items that were easier to match in the report task.

Overall this study suggests that humans retain a representation about the precision, and inherent perceptual value of information gained during fixations.

Listen up! Object-interactions are preferably recognized as objects versus actions depending on the sound's mechanical source – a pilot study

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Auditory input seems to be processed differently depending on its structure. This has been demonstrated for speech as compared to other sounds. The current study addresses the question whether non-speech auditory input may be processed differently depending on its origin. We examined if humans preferably recognize sounds produced by hand-object-interactions as actions or as objects. We differentiated classes of object-interaction sounds depending on whether the sound was primarily caused by the object itself (e.g. hairdryer), by the manual action (e.g. typing) or by manual manipulation of a sound providing instrument (e.g. guitar).

We recorded sounds of 42 interactions with every-day objects. Sixty-six subjects participated in the experiment. The participants were assigned to one of two groups: in group 1 (N=40) part of the participants were instructed to specify the correct action for half of the items and for the other half they were asked to specify the object that provided the sounds (the other part specified the sounds vice versa). Group 2 (N=26) was asked to name the source of the sounds without being primed to use either action- or object-words.

The results indicate that humans may rather infer an action or an object from an object-interaction-sound depending on the sound's mechanical source. The sound appears to be categorized preferably by an object-word if the object has the purpose of making sounds or does produce noises itself. If the manual manipulation is the relevant source for producing a noise with an otherwise silent object, then sounds are categorized as actions.

Developments in deep neural network models of perception: From low- to high-level vision

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Progress in many long-standing questions about the functional mechanisms underpinning visual perception has been stymied by the lack of computational models. Deep neural networks (DNNs) have recently become powerful candidate models of visual processing, after reaching human-like accuracy in object and face recognition. An initial wave of fMRI and electrophysiological studies around 2015 showed that features in object-recognition-trained DNNs well-predict neural responses in high-level visual cortex. The use of DNNs as models of biological vision has since flourished, with diverse custom networks, training tasks, and model evaluation methods emerging. The talks in this symposium highlight a range of approaches to current challenges, and span the gamut of visual processing from color perception, through material and contour perception, to object and face recognition.

One open challenge is building DNNs with ecologically plausible training tasks and experience. Katherine Storrs explores how perceptual dimensions can form in DNNs through unsupervised statistical learning, without the need for labelled examples. Katharina Dobs and Kshitij Dwivedi tease apart how experience of different visual diets and ecologically-relevant learning objectives affect representations in DNNs, and their performance as models of brain and behaviour.

As DNNs become more powerful, it becomes crucial to find nuanced ways to compare their perception to ours. Alban Flachot uses a large-scale custom dataset to probe how the fundamental visual competencies of colour perception and constancy develop. Christina Funke uses a closed contour detection task to show the challenges in assessing whether humans and DNNs use the same mechanisms. Finally, the talks showcase approaches for peering inside the "black box" of DNNs. For example, Martin Hebart presents a novel data-driven method for finding interpretable dimensions in DNNs, and compares these to those underlying human perception.

Collectively, the talks capture the diversity of DNN modelling in vision science.

Unsupervised learning predicts both successes and failures of gloss constancy

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We rely on vision to understand the physical structure of our surroundings. Yet, the raw visual input is ambiguous—retinal images result from complex interactions between 3D shape, lighting and surface reflectance. How do we disentangle these to perceive individual physical quantities, like how glossy a surface is? We reasoned that, paradoxically, it may be possible to learn to infer properties of the distal world by learning to model statistical structure in proximal images. To test this, we rendered 10,000 images of bumpy surfaces of random colours, bump heights, illuminations, and gloss levels. We trained an unsupervised neural network to learn the statistics of this dataset by learning to predict pixel values in images, and then compared its internal representations with human gloss judgments. Despite receiving no information about gloss, shape or lighting during training, we found that the model spontaneously clustered images according to physical properties like reflectance and illumination. Most strikingly, it also displayed characteristic "illusions" of human gloss perception caused by interactions between material, shape and illumination. For example, both humans and the model tended to see more highly curved surfaces as glossier. Across four psychophysical experiments, we found that the model's representations predicted specific patterns of successes and errors in human gloss perception better than ground truth, supervised neural networks, or diverse rival models. We suggest that unsupervised statistical learning may explain both the broad successes and idiosyncratic errors in our perception of physical quantities, in vision and beyond.

Stand vs Sit - Influence of posture on cognitive and emotional control

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Recent studies show that performance in cognitive conflict tasks (e.g. color stroop tasks) is improved when subjects perform the task while standing compared to sitting. These studies suggest that requirements to control postural muscles while standing consumes central resources, which improves selectivity of attention in cognitive control tasks. However, an extensive study fails to replicate these findings. Here, we systematically investigate body posture with varying difficulty (several standing positions and sitting position) on cognitive (spatial simon and color stroop) and emotional (emotional stroop) tasks.

Evidence for direct voluntary control of the pupil in a single case

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In pupillometric literature, voluntary control of the pupil is regarded as being impossible. Only indirect strategies, building on brightness-associated, near-response-related, or arousal-associated pupillary changes allow some control over the pupil. Here, we present a single case who can dilate his pupil diameter for about 0.8 mm and constrict its diameter for about 2.4 mm relative to an intermediate baseline. Using pupillometric and optometric techniques in combination with measuring electrodermal activity, various indirect mechanisms possibly mediating this phenomenon could be ruled out, partially for constriction and fully for dilation, i.e. accommodation, imagination of brightness, increases in arousal by increased mental effort. Furthermore, a vision acuity test performed at and closer than the near point where accommodation is maximal, the participant could still effortlessly increase his vision by 6.56 dpt via constricting his pupil compared to a control condition

without requested voluntary change. Using task-based functional magnetic resonance imaging we found an involvement of brain regions generating and mediating volitional impulses. Relative to externally driven (decreased illuminance) involuntary dilation, voluntary dilation of the present single case's pupil was associated with increased activation of aspects of the left dorsolateral prefrontal cortex (DLPFC, BA 46/9), adjacent premotor areas (BA 6), and supplementary motor area (SMA). It still remains open where these neural signals enter the final pathway. The learning history of our case and the neural architecture of the pathways let however assume that he at some point managed to decouple voluntary changes in accommodation and in pupil size.

Increasing the need for (and optimising the detection of) preparatory switching of auditory attention.

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Previous research on switching of selective auditory attention has adapted the task switching (cuing) paradigm and, consistent with task switching, has found a large cost of switching attention between two simultaneous voices based on gender or location. Some experiments also showed that, as in task switching, this “switch cost” can be substantially reduced by preparation – increasing the interval between the cue specifying target voice and the stimulus (voice compound). Other studies did not find this reduction in switch cost with preparation. This divergence likely arises from differences in experimental variables, some of which are known (from task switching) to influence the extent to which participants exert intentional control, and the detectability of the effects of control – for example, the proportion of switch trials and proportion of response-congruent trials. In addition to these “general” switching parameters, other variables may modulate the effectiveness of preparatory auditory (re)tuning. In particular, the use of only one voice per gender may allow for selective preparation for a specific voice, while presenting voices centrally rather than dichotically means that location is not a randomly changing irrelevant dimension that may distract attention. The current study seeks to optimise these parameters in a way that maximises the participant's need for (and our detection of) preparation for a switch of target voice. This would help determine if preparatory switching can indeed be effective in selective auditory attention and enable further investigation into which context variables are most critical for the manifestation, and detection of, preparatory switches of auditory attention.

Emotional valence and arousal of sources does not improve source memory

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Emotion-enhanced memory (EEM) describes the robust memory advantage of emotional over non-emotional stimuli. While extensively investigated with emotional items, EEM has been largely ignored with regard to emotional source information (i.e., the context of an item). Filling this gap, we tested if there is a source memory advantage for emotional over neutral source information by systematically manipulating source valence (positive vs. negative) between participants and source arousal (high vs. low) within participants. In Experiment 1, we used emotional sounds to manipulate context emotionality and presented them together with neutral pictures as items. In Experiment 2, which was a replication study conducted online, we used emotional background pictures to manipulate context emotionality in the same manner and presented neutral words as items superimposed on these emotional pictures. Multinomial model-based analysis showed a detrimental impact of negative high-arousing contexts on source memory in Experiment 1. However, this effect did not replicate over

experiments, suggesting that there are no (robust) effects of source emotionality on source memory, that is, no effects of source valence, source arousal, or a combination of both. The absence of benefits of source emotionality on source memory clearly indicates that emotionality effects differ between source and item memory. Additionally, we propose and discuss that material-dependent influences carry more weight if the used emotional material is limited in number, as is the case in the standard source-monitoring paradigm employing two sources only.

Teachers' Reactions to Interethnic Social Exclusion Scenarios

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In the current study, we used hypothetical scenarios to investigate pre- and in-service teachers' evaluations of interethnic exclusion among students. In these scenarios, the origin of the excluded student was varied (German vs. Syrian) as well as whether the participants got additional information about the situation or not (no additional information vs. information that the excluded student had insulted another student prior to the situation). Further, we assessed participants' own exclusion experiences and their intergroup contact with Syrians. The aim of this research was to examine whether the origin of an excluded student represents a relevant category for teachers' evaluations of social exclusion and to analyze the role of background information, own exclusion experiences, and intergroup contact in this context.

Data collection is still running, but preliminary analyses (N = 98) revealed in line with our expectations a main effect of the experimental condition, $F(3, 91) = 25.21$, $p < .001$, $\eta^2 = .45$. Namely, pairwise comparisons revealed that there was a significant difference between the conditions with negative versus no background information, $ps \leq .001$. However, in contrast to our expectations, there were no significant differences between the German versus the Syrian protagonists within the same background information condition. Further, there was a main effect of gender, $F(1, 91) = 4.97$, $p = .028$, $\eta^2 = .05$; as expected females rejected exclusion even more than male participants. Further analyses shall clarify the role of intergroup contact and own exclusion experiences.

Hazard-rate influence on performance is independent of spatial locus of attention

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Temporal expectations can be induced experimentally by creating temporal-regularities, for instance by presenting cues which are associated with specific time-intervals preceding targets (cue-based expectations). Even without these, expectations for an upcoming event increase with time according to the hazard-rate function – the conditional probability of an event to occur, given it has not occurred yet. Previous studies showed that cue-based temporal expectations depend on spatial attention: to benefit from information regarding stimulus onset, observers need to attend to its location. Here we examined whether hazard-rate expectations effects also depend on spatial attention.

In three experiments, we used two variations of a spatial-cueing task, with cue-target interval length varying in order to create an increasing hazard-rate. A spatial-cue appeared at the beginning of each trial in order to manipulate spatial attention (valid, invalid [Exp. 1] or neutral [Exp. 2-3]). After a random interval (500-2100ms) sampled from a uniform (Exp. 1-2) or an inverse U-shaped (Exp. 3) distribution, a target (asterisk) appeared briefly (33ms) and participants were instructed to indicate its location side as fast as possible (Exp. 1) or perform a single-button speeded-response (Exp. 2-3).

Using mixed-effects modelling, we observed in all experiments a validity effect on reaction-time (valid < invalid), along an overall effect of hazard-rate which differed between distributions, such that reaction-time decreased with increasing intervals. Importantly, this effect was observed in both attended and unattended locations. These findings indicate that unlike cue-based temporal expectations, hazard-rate predictions affect performance both within and outside spatial locus of attention.

Are source monitoring processes affected by methodological differences? An investigation of source presentation and testing

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Source monitoring is making attribution about the origins of memory records and comprises memory processes (i.e., item and source memory) and guessing biases. As of yet, there is no standard method for presenting the sources (in a mixed or blocked manner) or testing the monitoring processes (via the simultaneous test or the standard sequential test) in the literature. This potentially may give rise to confounds during item (e.g., was this word previously presented–old– or new?) and source (e.g., in which position was this word previously presented?) judgements. The core objective of the present study was to investigate these aforementioned methodological aspects of source monitoring by manipulating test format and source presentation within the same experimental design. Multinomial model-based analyses revealed a consistent effect of test format on item guessing but no systematic effect of source presentation on source monitoring processes. In case of no item detection, individuals were more likely to guess old in the simultaneous test compared to the standard sequential test. When presenting all possible response options at once (source A, source B, and new), the source choices (Source A and Source B) inherently refer to old, and they outnumber the new response two to one which, in turn, might lead to a more pronounced guessing bias in the simultaneous test.

Investigating attentional guidance in visual search with real-life scenes

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How is attention guided to relevant objects when looking at real-life scenes? Three sources of attentional guidance from the initial glimpse of a scene have been proposed: guidance based on target characteristics (object-based), based on location represented in the search history (episodic), and based on knowledge on typical target locations (semantic). Our present work aims at dissociating object-based and episodic guidance. The first study (n=5) successfully replicates the contextual cueing effect with real-life scenes and target letters (Brockmole & Henderson, 2006), generalizing this effect across different scenes. In a subsequent study (n=15), within the contextual cueing paradigm, we manipulated the efficiency of object-based and episodically guided search. Therefore, we selected repeated scenes in which the target letter was placed either on an object or at a fixed location not associated with an object. In the last four of ten blocks, these repeated scenes were presented horizontally mirrored. We hypothesized that search times for the location-based but not object-based targets should be prolonged in mirror trials if episodic guidance dominated and misguided search. To explore the role and interplay of episodic and object-based attentional guidance statistically, we tested a potential hierarchy of attentional guidance in a hierarchical linear model. Our findings suggest a dissociation of search processes based on the two sources of guidance and the adaptability of the search process according to scene characteristics.

Causal dissociable roles of parietal and medial frontal cortex in visual verticality judgements.

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Dorsal parietal and medial prefrontal cortex are active when participants perform visual perceptual judgements. It is not clear what causal role these areas play. We used transcranial magnetic stimulation (TMS) to interfere with these areas in groups of between 16-20 healthy people, while they performed the subjective visual vertical (SVV) task. Participants reported with a button press whether a flashed line was tilted counterclockwise or clockwise of true vertical. By fitting psychometric functions, we measured perceptual performance in terms of bias (also referred to as accuracy) versus precision (or sensitivity, threshold, reliability, sigma).

In the first study (Willacker et al. 2019), participants were sorted into two groups of 16 according to their baseline bias at SVV i.e. those with either a slight counterclockwise versus clockwise bias when judging a line to be truly vertical. Right parietal TMS facilitated verticality perception, reducing the difference between groups - affecting bias, with no effect on precision. ERPs suggested that the behavioural TMS effect occurred through normalizing individual SVV biases. No such effects occurred with control stimulation and tasks.

In the second study (Willacker et al. 2020), to ensure a high perceptual demand (putatively necessary to demonstrate a dorsal medial involvement) SVV lines were presented inside pop-out targets within a visual search array. Perceptual performance was analysed before and after theta-burst TMS stimulation of the medial frontal cortex, a control site, or no stimulation, in three groups of 20 people. Medial frontal stimulation improved the precision of verticality judgments with no effects on bias.

Investigating the Influence of Mindfulness Intervention on Knowledge Sharing in a High-Reliability Organization

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In this experimental approach, we investigated the impact of a mindfulness intervention on knowledge sharing and knowledge collecting (de Vries, van den Hooff & de Ridder, 2006) during a two-day command post exercise of German police officers' master studies.

Mayring (2010) identified three personal backgrounds (cognition, emotion, action) influencing communication's semiotic aspect. These three backgrounds were addressed during the mindfulness intervention used in the field study, with participants being asked to provide a short statement about their current state of cognition, emotion, and physical experience. The intervention was conducted before and after each of the two daily command post exercises for the experimental group (N = 46), while no intervention occurred for the control group (N = 50). Knowledge sharing and knowledge collecting were assessed with the Knowledge Donating and Knowledge Collecting Items (de Vries et al., 2006). While planned contrast analyses revealed no effect for knowledge donating, our data suggest a positive influence of the mindfulness intervention for knowledge collecting. These differences between sharing and collecting might occur because knowledge collecting is more implicit and part of the process of building a shared mental model (Cannon-Bowers, Salas & Converse, 1993). The impact of knowledge collecting will be discussed in light of the self-determination theory (Deci & Ryan, 2000) and the impact of individual and collective mindfulness in high-reliability organizations (Weick, & Sutcliffe, 2001).

How Does Probability Learning Develop in Early Childhood? A Longitudinal Investigation

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Probability learning is a key ability for dealing with the demands of an uncertain world. What is the age trajectory of choice strategies relying on this ability and which cognitive factors shape the development of choice behavior? In a previous cross-sectional study, we found that while toddlers and adults tend to maximize probability in a repeated choice task, school-age children were more likely to probability match by the use of a simple win-stay lose-shift heuristic. Toddlers' maximizing behavior was likely driven by a tendency to persist with one choice option, irrespective of whether this option maximizes probability. Probability matching and the use of simple heuristics, by contrast, seem to be behaviors whose prevalence increases over childhood. Here, we will present an ongoing longitudinal investigation examining the intraindividual development of choice behavior. This study also explores the role of response inhibition and working memory capacity in shaping toddlers' use of different strategies. The planned sample initially includes 60 children aged 3.5–4.5 years who will participate in three measurement waves over two years. Data collection will take place exclusively online to ensure the safety of participants and researchers and to reduce the risk of participants dropping out. This study is the first one, to our knowledge, to trace the choice behavior of children in a probability learning task longitudinally and will contribute to an ongoing debate about the cognitive factors underlying probability matching and maximizing.

Non-invasive brain stimulation of right dorso-lateral prefrontal cortex enhances cognitive reflection performance

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Transcranial direct current stimulation (tDCS) was used to investigate whether stimulating the left or right dorso-lateral pre-frontal cortex (DLPFC) compared to a sham group modulated performance on a number of judgment and thinking tasks. There were three tasks: vignettes assessing heuristic thinking, logic syllogisms, and the cognitive reflection test (CRT). Results showed that anodal tDCS to the right DLPFC was associated with an increase in cognitive reflection performance (through cognitive inhibition of non-normative responses) compared to performance after left DLPFC and to sham ($n = 18$ in each group) stimulation. A second experiment focusing on the right DLPFC confirmed these results, and further showed that once repeated stimulation also increased performance in the CRT (compared to repeated stimulation plus sham). Individual differences in cognitive ability and thinking style cannot account for these findings, which are broadly consistent with a dual process framework of thinking processes. The results demonstrate the causal involvement of the right DLPFC in cognitive reflection and suggest the possibility of improving judgment performance through tDCS.

(When) is learning in a conditioning procedure with valent targets unconscious?

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Evidence for unconscious learning was reported by Greenwald and De Houwer (2017) from a speeded learning procedure in which masked letter strings (CSs, 75 ms) were presented as primes before pleasant or unpleasant targets (USs), whose valence had to be categorized. During the learning phase, one CS predicted positive targets (CSpos), and one predicted negative targets (CSneg). In the test phase, CSpos and CSneg preceded both pleasant and unpleasant USs (50 % contingency). Categorization performance was better for CS-US pairs from the learning phase than for new pairs (conditioning effect), while the CSs were claimed not to be discriminated above-chance: Regressing the conditioning effect on the discriminability of the CSs resulted in a positive intercept (learning in the absence of consciousness) and a zero slope (independence of learning on consciousness).

Here we approach two questions regarding the unconsciousness of this learning effect. First, we address whether learning indeed occurred independent of and in the absence of consciousness by inducing more systematic variance that is a precondition to detect a correlation between learning and consciousness, and by testing the validity of the applied regression method and the errors-in-variables correction with simulations. Second, we discuss procedural parameters that might be relevant for unconscious learning by comparing the learning paradigm by Greenwald and De Houwer – with masked and with non-masked CSs – and a similar paradigm by Schmidt and De Houwer (2012).

Generalizing visual categories from a single novel object

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When encountering a novel object, humans have the striking ability to generalize how other objects from that category look like. To study this phenomenon participants viewed 2D silhouettes of abstract exemplar objects, differing in their shape characteristics, and were asked to draw new objects belonging to that category. Independent observers consistently grouped these drawings with the correct exemplar, indicating that through these drawings genuine perceptual categories were produced. How do observers know the variability of a category without any prior experience with it? Here we analyze the drawings from each category to shed light on potential strategies used in the creation process. We show that many of the participants drawings were based on a strategy in which the exemplars were analyzed in terms of part-segmentation and curvature characteristics; the individual parts were then varied and reconfigured to create a new shape. We also show that certain parts of the exemplars, consistently seen to be more distinctive than others, were an important categorization cue. These findings showcase how consistently humans generalize from very sparse data in an unconstrained task, and provide insights into what biases and strategies make this possible.

Individual differences in generalized reciprocity in the double dictator game

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Our study investigated generalized reciprocity, the phenomenon of reciprocating experienced behavior towards a third party, in a double dictator game (DDG). We hypothesized that participants would display generalized reciprocity meaning that the amount of money received by a participant in the DDG would influence the amount this participant gave as an allocator. Furthermore, we investigated the relationship of generalized reciprocity and the HEXACO personality factors Agreeableness and Honesty-Humility. Due to its association with negative reciprocity, we predicted Agreeableness would moderate the relationship between the amount received and the amount given in such a way that the relationship would be stronger for individuals low in Agreeableness. The amount of money received and Honesty-Humility predicted the amount of money given. However, we did not find a significant moderation of Agreeableness on the relationship between the amount of money received and the amount of money given. While our study supports the importance of generalized reciprocity and Honesty-Humility in economic games, the role of Agreeableness remains uncertain. We discuss implications of the results for future investigations of generalized reciprocity and personality factors in economic games.

Agency for prevention behavior

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When acting, we affect our environment. In doing so, we generally feel in control of our actions and their consequences, a phenomenon termed sense of agency. Agency is well documented for actions that aim at causing perceivable effects in the environment, but not all actions aim at causing an effect – rather, actions may also aim at preventing a certain event from occurring. Such prevention behavior poses a critical challenge to the cognitive system, because successful prevention inherently revolves around the absence of a perceivable change. Based on a series of experiments, we will show that this state of affairs leads to a profound dissociation of explicit and implicit measurements of agency: Whereas participants reported high levels of agency in explicit judgements, there was no sign of agency in corresponding implicit proxies, i.e., temporal binding. These results attest to an altered action representation for prevention behavior and support recent proposals to model related processes such as avoidance learning in terms of propositional rather than associative terms.

Under-confidence in peripheral vision

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Our visual experience appears uniform across the visual field, despite the poor resolution of peripheral vision. This may be because we do not notice the missing details in the periphery and believe that peripheral vision is just as rich as central vision. In other words, the uniformity of the visual scene could be explained by a metacognitive bias rather than being a perceptual phenomenon. We deployed a confidence forced choice method to measure metacognition in peripheral as compared to central vision. Participants judged the orientation of gratings presented in central and peripheral vision, and reported whether they thought they were more likely to be correct in the perceptual decision for the central or for the peripheral stimulus. Observers were under-confident in the periphery: higher sensory performance in the periphery was needed to equate confidence choices between central and

peripheral perceptual decisions. A second experiment showed that the gain in perceptual sensitivity for high confidence perceptual decisions is lower when participants compare central to peripheral perceptual decisions than when they compare peripheral to peripheral or central to central perceptual decisions, indicating a specific impairment of metacognitive performance when humans compare central and peripheral vision. A third experiment showed that peripheral under-confidence does not arise because observers based confidence judgments on stimulus size or contrast range rather than on perceptual performance. Taken together, results indicate that humans are impaired in comparing central with peripheral perceptual performance, but metacognitive biases cannot explain our impression of uniformity, as this would require peripheral-over confidence

Does language activate the sensorimotor properties of the entities it refers to and, if so, under what circumstances?

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The simulation view of language comprehension holds that language prompts reenactments of sensorimotor experiences. For the color domain, this for instance suggests that reading about a stop sign re-activates experiences involving the perception of the stop sign and hence experiences involving the color red. This should hold even in cases in which the linguistic stimulus does not explicitly refer to the color red. The evidence in the literature concerning this hypothesis is inconsistent, with some studies showing facilitation and others interference. The aim of the current study was threefold: First, providing an additional test whether comprehenders re-activate color experiences during comprehension. Second, finding out whether a match between implied and perceived color leads to facilitation or interference. Third, testing a new paradigm. Participants were presented with individual words (Exp.1) or sentences (Exp.2a/b) referring to objects with a typical color of either green or red (e.g. cucumber or raspberry) along with two clickable “yes” and “no” buttons, one of which was red and the other green. Location and button color varied from trial to trial. The tasks were lexical decision (Exp.1) and sensibility judgment (Exp.2), whereby the sentences in Exp 2 differed with respect to whether or not the critical noun (e.g., raspberry) occurred as the final word of the sentence. We observed faster response times in the match vs. mismatch condition in all conditions, suggesting that comprehenders indeed re-activate color experiences when processing different types of linguistic stimuli referring to objects with a typical color.

How valid are statements about the pre-crash phase of persons involved in an accident? A comparison with objective data of the Event Data Recorder (EDR)

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Statements of persons involved in a traffic accident are important instruments for analyzing the accident causation from a scientific or a legal perspective. However, there might occur a lot of bias and falsification along the way of perceiving the accident, storing the information in our memory and recalling these memories for answering questions about the accident [1; 2]. Novel technologies installed in modern cars provide new insights in the seconds prior to an accident. The Event Data Recorder (EDR) records various parameters (e.g. speed, steering angle, activation of the brake, etc.) the last five seconds prior to a crash event. But to what extent do the statements given by the persons involved in the accident differ from the objective data of the EDR?

By now, there are 29 accidents in the AARU (Audi Accident Research Unit) database, for which a psychological interview with the driver exists as well as data of the EDR. An analysis of this data has shown differences between the information taken from the interview and the retrieved data concerning the driven speed and the reaction prior to the crash. In some cases, the discrepancies have been so significant that the EDR data showed another sequence of events leading to the accident.

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Looking in patterns: Recurrence quantification analysis (RQA) of eye movements

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The hypothesis of reading time regularity states that the degree of regularity in measures of the reading process is informative about reading fluency and comprehension. The current study aims at testing this assumption, namely that eye movement fluctuations contingent on linguistic information differ in their temporal structure from endogenous fluctuations of eye movements that are not contingent on external information.

To that end, three language-unrelated conditions were chosen which serve as ‘baselines’ for eye movements in the absence of external information (looking at blank screens, fixation crosses or random patterns of circles on a screen). Another three conditions were selected reflecting different degrees of available linguistic information (encoding x-sequences, reading scrambled texts, actual reading of newspaper articles).

Eye movements of 26 native speakers of German were recorded with a sampling rate of 1000 Hz. Gaze steps were computed by differencing the raw 2D position data, and subsequently subjected to recurrence quantification analysis (RQA) quantifying various dynamic properties of the time series related to the degree of randomness and structure of their temporal evolution.

The results show that eye movement fluctuations during text reading differ systematically in the strength and degree of temporal structure compared to ‘baseline’ conditions that putatively capture endogenous fluctuations of eye movements in the absence of (linguistic) information. These findings provide a new and important perspective for further studies investigating natural reading as complex, dynamical process using measures of temporal structure.

Cognitive mechanisms of decision irrationality

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Humans violate rational choice theory but why they do so remains one of the largest mysteries in the cognitive and decision sciences. I will present a new model, dubbed selective integration, according to which decision irrationality stems from an attentional selection process that enhances the gain of processing of stronger inputs at the expense of weaker inputs. Although this attentional selection process leads to violations of axiomatic decision theory (such as violations of the axioms of transitivity

and regularity) it has a normative justification: it nullifies the corrosive influence of late noise arising beyond the sensory stage. I will present a series of experiments, in which the ameliorative role of selective integration is confirmed, suggesting that apparently irrational decisions are a side effect of a rational evidence accumulation process.

Attentional templates in visual foraging: Insights from TVA

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The notion that attentional templates guide attention toward objects with matching features is widely accepted. Nevertheless, few formal theories include the cognitive mechanisms that instantiate these templates and switch between them as observers interact with their environment. Bundesen's theory of visual attention (TVA) includes top-down parameters (pertinence and bias) that can be considered manifestations of attentional templates. However, how the visual system sets and changes these parameters has not been modeled in detail. Here we present such extensions to TVA that allow simulating data from "visual foraging" tasks, in which observers search for and collect multiple target types and hence have to switch templates. We compare different versions of these simulations with experimental data to assess which amendments to the current theory agree best with empirical observations.

The effect of prediction error on episodic memory

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An important function of the memory system is to generate predictions about the environment, and prediction error (PE) occurs when a prediction is violated by a subsequent episode. However, to date, the effect of PE on episodic memory is not well understood. The present study thus aimed to investigate the relationship between PE and episodic memory. We asked our participants to learn sequentially presented sound-picture associations whereby sound categories predicted the paired picture categories to varying degrees. On the next day, participants underwent the encoding of individual pictures in relation to sound categories and a surprise recognition memory test. Participants were asked to make old/new judgments on the encoded pictures as well confidence ratings, and to retrieve the paired sound as well. We expected that highly predicted picture categories would lead to low PE, while moderately or minimally predicted categories lead to medium or high PE, respectively. We hypothesized a U-shaped relationship between PE level and recognition memory performance, that is, better recognition performance should be observed for high PE and low PE in comparison to medium PE. The preliminary results indicated that hit rates for low PE were higher than medium and high PE levels (i.e., congruency effect). This suggests that participants' recognition memory is strongly affected by what they learned from their prediction.

Current Research on Metamemory Monitoring

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Research on metamemory monitoring examines how well people can predict their future memory and judge their memory performance during tests. This symposium will bring together research on this remarkable human ability from labs in Poland, Portugal, Turkey, and Germany. The first two talks will focus on the reliance on specific cues in memory predictions assessed via judgments of learning (JOLs): Mendes, Lunas, and Albuquerque will present conclusive evidence that JOLs are based on word frequency. Zimdahl and Undorf investigate why and how visual coherence impacts JOLs, demonstrating the influence of perceptual fluency. Next, Bröder and Undorf will present first research on JOLs for pictures and show that multiple cues are integrated into memory predictions for this material type. The final two presentations examine how the type of memory test shapes metacognitive monitoring. Eroğlu and Besken find metamemory monitoring to be insensitive to the type of test in an episodic list generation task. Finally, Butowska, Hanczakowski, and Zawadzka will examine metamemory confidence judgments in forced-choice recognition and identify under which test conditions confidence and accuracy align versus dissociate. Together, the five talks of this symposium present new insights on metamemory monitoring across a range of item types and memory tasks.

Multisensory Integration in Memory Predictions

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Information is often easier to perceive when presented in multiple modalities than when presented in a single modality. For instance, words that one simultaneously reads and hears are easier to identify than words that one only hears. Multisensory facilitation typically follows the principle of inverse effectiveness: Facilitation is larger for low-intensity stimuli than for high-intensity stimuli. We examined whether multisensory facilitation and the principle of inverse effectiveness would extend to memory predictions. In three experiments, participants studied unisensory and multisensory stimuli, predicted their later memory performance (judgments of learning; JOLs), and completed a free recall test. We systematically varied stimulus intensity in one modality and sometimes added information in a second modality. In Experiment 1, words printed in several font sizes were sometimes accompanied by spoken equivalents. In Experiments 2 and 3, spoken words heard against several levels of background noise were sometimes accompanied by visual speech articulations. Results revealed multisensory facilitation in the speed and/or the correctness with which words were perceived. Also, multisensory facilitation in perception increased with decreasing stimulus intensity. Multisensory stimuli received higher JOLs than unisensory stimuli, but this difference did not vary with stimulus intensity. Thus, memory predictions did not follow the principle of inverse effectiveness. Recall performance did not differ across multisensory and unisensory stimuli. Implications for theories of metamemory and memory are discussed.

Fluency and truth – A test of competing explanations

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Processing fluency influences truth judgments: People judge information truer if it is easy to process. However, there are competing explanations about the underlying processes. First, a fluency-positivity explanation assumes that processing fluency is a positive experience. As truth is also a positive concept, people would be more likely to judge positively experienced information as “true”. Second, a fluency-amplification explanation would assume that processing fluency amplifies any judgmental tendencies. As people typically judged truth, fluency would amplify these truth judgments. Third, an ecological account would assume that people learn that fluency indicates truth in a given ecology. Across two pre-registered experiments (total N = 350), we compared these explanations. In Experiment 1, we asked participants if a given statement was “fake news from social media”; processing fluency increased participants’ likelihood to judge statements as “fake news”. This is in line with the amplification and the ecological account, but not with the positivity explanation. Experiment 2 omitted the social media context and asked participants whether a given statement was “false” or not; processing fluency decreased participants’ likelihood to judge statements as “false”. This is in line with the positivity and ecological account, but not with the amplification account. Thus, across two experiments, the ecological account is supported. Accordingly, people may use fluency to judge truth as a function of the fluency cue’s validity in a given ecology.

Embodying an Old Age Virtual Avatar Leads to Decline in Physical Performance and to Avoidance of Self-observation

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Background. Stereotypes about the aging process have been shown to affect human behavior and long-term health parameters. Even though the manipulation of age stereotypes has been done in an experimental setting, most approaches appear superficial and lack complexity on a sensory level. Method. In this study we advanced the experimental activation of self-reflexive age stereotypes by using virtual reality (VR) technology. In a perfect virtual copy of the lab, young participants (N = 60) embodied either an age-congruent (control group) or an aged avatar (experimental group). Physical performance and viewing direction towards a virtual mirror were measured as dependent variables after random assignment to one of the two groups. Results. Embodiment of an old age avatar led to declining handgrip strength, compared to the young avatar age group. Distinct performance patterns suggest mechanisms based on resource management strategies. Effects were moderated by negative age stereotypes matching respective performance domains. Linear machine learning models of head rotation patterns revealed strong avoidance of the own old age mirror image, compared to the young age virtual appearance. Conclusion. Immersive VR embodiment of an old age avatar activates self-reflexive age stereotypes and has an impact on relevant performance parameters, which is presumably mediated by motivational strategies and moderated by preexisting stereotypes, that match the relevant performance domain. Even though the intervention did not show an increase of negative affect, the old age avatar group avoided self-observation in the virtual mirror, possibly due to visual cue related self-rating with regard to social norms.

Is there more than one way to think about pizza? The role of modal and amodal representations in uncontrolled eating

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Uncontrolled eating is assumed to be determined by an interplay of elevated approach towards and insufficient inhibition of food-related stimuli. To date it is unknown which cognitive mechanisms and representations underlie these two behavioural tendencies. Crucially, the relative contributions of modal and amodal representations to maladaptive eating behaviour are yet to be determined. Here, we describe our plan to disentangle experimentally these contributions, with a focus on the different ways in which food can be presented. Specifically, we aim to induce modal representations through stimuli that emphasize sensory features, whereas amodal representations will be induced through stimuli that de-emphasize these features and are processed in higher cognition. Both types of representations will subsequently be evoked during established paradigms that test approach and inhibition tendencies. Creating a better understanding of the influence of modality on these crucial aspects of eating behaviour will not only have implications for the use of food-stimuli in experimental research, but will also inform interventions targeting maladaptive eating behaviours.

Do automatic inferences determine our preferences? The role of inferential processes in evaluative learning.

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Evaluation is a core component of our lives. It not only guides our judgments and decisions, but also influences how we treat other people or which products we consume. Moreover, much of our more automatic (e.g., habitual, or addictive) behaviour is thought to strongly depend on evaluative processes. It is therefore of critical importance to understand how, when, and why evaluations are established and what factors determine their change.

Theorists have argued that the learning of our likes and dislikes and related automatic behaviour is the outcome of implicit processes that operate on the basis of mental associations rather than explicit, belief-based processes that drive more controlled behaviour. In applied fields, intervention studies targeting maladaptive (e.g., addictive) behaviour have therefore often used associative learning procedures designed to facilitate automatic changes in mental associations. Yet, recent findings do not fit well with dominant associative or dual-process theories and challenged key underlying assumptions.

Building on recent theoretical developments in the field of cognitive (neuro-)science, I propose an alternative, single-process view, that evaluative learning is determined by automatic inferential reasoning processes. From this perspective, automatic inferences determine how we feel and act in response to stimuli.

This inferential theory represents a shift in thinking about human behaviour and how we can most efficiently promote behavioural change that benefits our environment at the individual and societal level (e.g., to improve well-being, treat clinical disorders, or facilitate protection of our natural environment). I will discuss recent research testing the value of this theoretical framework.

Discrete vs continuous action-feedback and their effects on behavioural and neural processing during predictive action-feedback monitoring

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In order to establish meaningful interactions with the environment, we need to be able to distinguish self-generated from externally generated sensory input. It is thought that this is mediated by predictions based on the efference copy, which lead to perceptual and neural suppression of self-generated sensory stimuli. However, the brain areas that are suppressed vary across different studies. Furthermore, sometimes perceptual enhancement has been found. In the current fMRI study, we investigated whether the type of feedback can explain the heterogeneous results. Participants performed active and passive hand movements using a passive movement device. In some conditions, participants received continuous visual feedback of the action, in other conditions discrete action outcomes were presented. In all cases, participants were asked to detect variable delays inserted between action and feedback. Both feedback types led to widespread suppression in active conditions in sensory areas (visual and somatosensory areas), motor areas (motor cortex, cerebellum), and temporoparietal areas often associated with self-other distinction (angular gyrus, middle temporal gyrus), suggesting large commonalities in neural processing of both feedback types. However, we also observed feedback dependent differences. First, neural suppression in visual cortex for discrete outcomes correlated with perceptual thresholds, such that more suppression was related to more perceptual enhancement. Second, participants were more precise in discriminating delays for continuous feedback, and this condition showed more suppression in right superior temporal gyrus, Heschl's gyrus, and insula. Altogether, these results suggest that discrete and continuous action feedback are similarly suppressed, but might depend on different underlying predictive mechanisms.

Good morning Smartphone! Assessing bed-time and wake-up patterns of large cohorts with smartphone data

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As increasingly ubiquitous companions, smartphones offer insights into our everyday life. They accompany us to bed, and we use them first thing after waking up. Smartphone usage data has been shown to correlate with the user's lifestyle. Thus, it promises a way of assessing sleep while overcoming the downsides of traditional sleep-assessment methods such as self-assessment (e.g., questionnaires) and methods requiring medical assistance (e.g., polysomnogram). Further, smartphone-logged data shows our app engagement patterns. Previous research suggests that social media usage is related to sleep quality. Real-time smartphone-logging may be an objective means to analyze how app behavior relates to our sleep and health.

Our objective was to explore how sleeping patterns can be estimated using smartphone usage data alone. We analyzed real-time smartphone data of 860 participants from Germany from July until October 2020. We used socio-demographic information to analyze differences between age groups, sex, and different employment states.

Results suggest that smartphone data is a promising means of approximating bed-time and wake-up patterns on individual and population levels. For example, we found that in 20% of nights, employed people in Germany have less than six hours of smartphone-free time at a stretch. Another finding is

that, on average, students, compared to workers, wake up an hour later in the morning. Social media apps are among the top last-used apps at night, and the first-used apps the next morning.

While our analysis was only exploratory, it shows the potential of smartphone data for sleep research and beyond.

We know the sum – but what are the parts? Interactions between different influence factors on the Implicit Association Test (IAT)

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The Implicit Association Test (IAT, Greenwald, McGhee & Schwartz, 1998) has been used in almost every field of psychology. Despite its wide spread application as an implicit measure of attitude, the IAT was criticized for different methodical reasons. More specifically, participant-related factors (e.g. training), instruction-related factors (e.g. framing of stimuli) and setup-related factors (e.g. block order) have been shown influencing IAT performance and thus questioning the interpretation of the classical IAT effects as solely a measure of implicit attitudes. However, no study has yet investigated the combined effects of more than one methodological factor within the same study. Thus, the present study investigated the influence of several setup-related factors simultaneously. As between-subject factors, our well-powered study (N = 90) used the typical flower-insect IAT to systematically investigate the (mutual) effects of the block order (insect vs. flower combined with positive first) and valence position (positive in the left corner vs. negative in the left corner). As within-subject factors, IAT version (pictures or letters), stimulus category (insects or flowers) and block type (crossed [e.g. insect + positive] or recrossed [e.g. insect + negative]) were included in the analysis.

Faster responses were across all analyses observed for flowers in both the picture and the letter IAT. Various interaction between different IAT setup-related factors were observed in the picture IAT. Thus, the picture IAT proved to be particularly sensitive to the unintended influences of these setup-related factors.

Can We Mindfully Control Our Attention: Differential Mechanisms of Short-Term Meditation and Relaxation and Their Impact on Attention and Executive Functioning

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While some studies on mindfulness-based interventions present beneficial effects on cognitive functions (e.g. Chiesa et al., 2011) others found no consistent effects (e.g. Anderson et al. 2007; Lao et al., 2016). Reasons for the inconsistency of findings may be the great variety in research designs as well as the frequent absence of active or passive control conditions. Furthermore, processes underlying effects of even short inductions (10 to 20 minutes; Brown et al., 2016; Ostafin & Kassman, 2009; Wenk-Sormaz, 2005) may be unspecific to mindfulness and these effects may be attainable otherwise, such as through relaxation (Fell et al., 2010).

Therefore, the current study compared effects of a short-term mindfulness meditation with those of progressive muscle relaxation (active control condition) and listening to podcasts (passive control condition) in a 3 (condition) x 2 (time) pre-post experimental design. 78 participants were randomly assigned to experimental conditions and received respective instructions for 20 minutes, twice within 5 days. We assessed components of executive functions and attentional networks with the Attention

Network Task, Continuous Performance Task, n-Back and Number-Letter Task. Results were analyzed using Generalized Linear Mixed Modelling, which allowed for the inclusion of single-trial reaction-time data and the investigation of differences in response patterns within and between participants.

Results show that while updating and conflict resolution similarly benefitted from meditation and relaxation compared to listening to podcasts, measures of inhibition and shifting reflect differential effects of inductions. Alerting and orienting were not affected. Theoretical implications for models of mindfulness are discussed.

The Architecture of Preference Acquisition: Typicality, Fluency, & Valence

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People prefer exemplars typical of a category over atypical exemplars, a phenomenon known as prototype-preference effect (PPE) or beauty-in-averageness effect. This empirically robust phenomenon has been explained in terms of hedonic processing fluency. That is typical exemplars are easier to process and therefore liked more than atypical ones. The present research tests prototype preferences as a function of category valence. In a series of three experimental studies, we conditioned category exemplars with positive or negative valence. Whereas the PPE replicates for categories associated with positive valence, the PPE reverses for categories associated with negative valence. Moreover, we show a mediated moderation by fluency: typicality increase fluency, but effects of fluency on liking depend on category valence. Results have implications for the hedonic fluency model, the fluency-amplification hypothesis, but also for related phenomena such as the mere-exposure effect and evaluative conditioning.

Impact of a bidirectional 3D code pre-view on task performance and learning outcome

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For novices in computer science, it can be particularly beneficial to add a 3D preview to the code editor. In computer-based learning environments, additional interactive elements can be used to visualize correspondences between the elements and relations of the code and what is displayed in the 3D preview. For instance, element to element mapping can be realized by colored highlights and relation to relation mapping as bidirectional linking between the code and the preview. Thereby, users can see effects in one representation while manipulating the other. The combination of both mapping aids can also lead to synergetic effects, which might nevertheless depend on learners' aptitudes. In the present study, the learners had to code three quadcopter missions in an interactive online learning environment. For this purpose, a visual code editor with interlocking blocks (blockly) and a 3D preview of the flight trajectory were available. So far, we tested N=55 participants in our 2x2 between-subject design study. We investigated the impact of highlighting (with or without) and bidirectional linking (with or without) on learning outcome and code correctness. As data collecting is still ongoing, we analyzed the impact of mapping aids vs. no additional support. Our preliminary results imply, that mapping aids had a significant positive effect on the learning outcome at the comprehension level but not on code correctness. We collect additional data to gain further insights into the underlying cognitive learning processes when using highlights and bidirectional links for coding. Furthermore, we will analyze the effects of learners' aptitudes.

Moving language-production research online – an implementation of the picture-word interference paradigm

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So far, language production experiments with voice onset latencies as dependent variable have not been conducted online due to technical difficulties. Especially the poor audiovisual synchrony in web experiments (Bridges et al., 2020) is a challenge to time-locking stimuli and participants' spoken responses. We tested the viability of conducting language production experiments with overt articulation in online settings using the picture-word interference paradigm – a classic language production paradigm. In three experiments (N=48 each), participants named an object picture while ignoring a visually superimposed distractor word. To this end, we implemented a custom voice recording option in two different web experiment builders and recorded naming responses in audio files. After the experiment, we extracted voice onset latencies from these stimulus-locked audio files. In a control task, participants classified the last letter of an object picture's name as a vowel or consonant via button-press (see Abdel Rahman & Aristei, 2010). We expected slower responses when picture and distractor word were semantically related compared to unrelated, independently of task. This semantic interference effect which is robust but small (18-24ms according to a meta-study by Bürki et al. 2020) and therefore crucially depends on precise timing, was successfully replicated in this online setting, both for button-press and overt naming responses. This provides a proof of concept that naming latency - a key dependent variable in language production research - can be reliably measured in online experiments. We will discuss the challenges for online language production research and give suggestions how to overcome them.

Measuring laughter: How wearable devices can improve data accuracy

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Laughter is highly associated with positive affect. As an everyday social behavior, many aspects of it warrant a naturalistic investigation. Hence, previous investigations have used the Experience Sampling Method (ESM), to acquire in situ data.

ESM benefits from unobtrusiveness, as it is very sensitive to participant compliance. For topics like laughter frequency, commonly used ESM implementations (e.g., smartphones) might be unsuitable. Participants might be reluctant to take out their phone in social situations, where laughter events most likely occur.

We tried to alleviate this problem by using simple wrist-worn one-button wearables. These devices are always readily available for data entry without getting in the way. Furthermore, taking a measurement will not interrupt the situation to the same extent as it would on smartphones.

In an ongoing study, we attempt to measure laughter frequency and the impact of the used device. Participants log their laughter events over a period of four weeks by either using a smartphone or wearable (between-subject design).

First, preliminary results (N = 44) show a significant difference between the number of logged laughter events per day for wearables (M = 5.85, SD = 7.19) compared to smartphones (M = 2.42, SD = 3.61), $t = -8.80$, $p < .01$, $d = 0.59$.

We attribute this stark contrast to increased participant burden in the smartphone group, which illustrates the need for unobtrusive technical solutions for ESM research. Wearables therefore seem to be beneficial for the assessment of frequent and social events compared to smartphones.

Interindividual Differences in Cognitive Control: A Latent Profile Analysis on RT Patterns in the AX-Continuous Performance Task (AX-CPT)?

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Cognitive control is an important ability to master everyday life. The dual mechanisms of cognitive control framework states that context representation and maintenance during information processing are the key components of cognitive control (Braver, 2012). Maintaining goal-relevant information in anticipation of a certain event or stimulus is referred to as the Proactive Mechanism of Control (PMC). Reactive Mechanism of Control (RMC) describes stimulus or event driven activation of goal-relevant information. Depending on respective task demands, engagement in either mechanism of control can vary (Gonthier et al., 2016). Additionally, Braver (2012) assumed interindividual differences in the extent of engagement in PMC or RMC regardless of task demands. Goal of the present study was to investigate whether groups of individuals can be identified that differ in the extent of using PMC and/or RMC. Reaction time (RT) data of 210 individuals with heterogeneous educational background, who completed the AX-Continuous Performance Test (AX-CPT) as a sensitive tool to examine PMC and RMC, was analyzed. By means of a latent profile analysis (LPA), three different classes were identified. One class showed a PMC-typical RT pattern across conditions. Another class had similar mean RTs, but the PMC-typical pattern was less pronounced. The third class had the slowest mean RTs and their RT pattern was more (but not completely) consistent with a RMC pattern. Results demonstrated clear interindividual differences of cognitive control within the same task. Therefore, interindividual differences should be controlled for in future research as not to overlook the true nature of cognitive control.

Is misremembering crucial for recognition memory? An investigation of the error speed effect

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The error speed effect describes the phenomenon that the speed of single-item recognition errors predicts performance in subsequent two-alternative forced-choice (2AFC) trials that include an item with a previous incorrect response. This effect only arises if the speed of recognition errors reflects the underlying misleading evidence or can discriminate between errors from incorrect guesses and incorrect detection. However, previous investigations included error-correction instructions and provided feedback within 2AFC trials. This experimental design might just as well evoke an error-correction strategy that uses response latency as a heuristic cue to guide 2AFC responses and results into the same behavioral pattern as the error speed effect. Replicating the procedure of Starns et al. (2018) and introducing in addition an extension condition that controlled for the named shortcomings (each $n = 130$), we replicated the error speed effect within both conditions. Regardless of the respective condition, error speed of single-item responses was predictive of subsequent 2AFC performance. More precisely, slow errors were associated with increased 2AFC performance compared to fast errors. These results foster the assumption that speed of recognition decisions reflects the amount of underlying memory evidence rather than being used strategically to improve 2AFC performance. Moreover, the present results lead to the conclusion that misremembering is a crucial mechanism within recognition memory.

Dynamic modulation of somatosensory processing during reaching and grasping

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Somatosensory sensitivity on a limb is typically suppressed when this limb is moving compared to when not. This is reflected in suppressed sensations of tactile stimuli that are applied to a limb shortly before or during its movement. I will present recent findings that show a dynamic modulation of somatosensory processing on a moving hand during goal-directed hand movements. More specifically, I will show that tactile stimuli on a moving limb are not simply suppressed, but that the strength of this suppression is strongly modulated by the informational value of the associated somatosensory feedback. I will present results that show weaker suppression when interacting with objects of unknown dynamics and, thus, when feedback signals become more important for the movement. Somatosensory modulation is further evident throughout the time-course of a movement, with diminished suppression around the onset of the movement's guiding phase. Lastly, when visual feedback about the reaching limb's position is available, suppression appears to increase with greater reliability of the visual feedback estimate. In summary, somatosensory suppression is strongly dependent on the importance of associated feedback signals for the task at hand.

Long-term visual deprivation effects selective visual attention, short-term memory and cortical plasticity

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Little is known about plasticity in the human adult visual cortex. Aim of this study was to better understand the nature of neuroplastic changes in the visual cortex. Studies with up to 150 minutes of monocular deprivation have shown to alter visual perception in adult humans.

In this study we used long term monocular deprivation about 7 days with intervals of 1, 3, 5 and 14 days to test for short- and long-term structural and functional changes in brain visual networks by structural and functional MRI. TVA (theory of visual attention)-based assessment was used for sensitive investigation of functional changes in short-term memory and visual attention.

Multidimensional Detrended Fluctuation Analysis (MdDFA) for the quantification of global long-memory processes and its application to EEG data

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Investigations of physiological and behavioral time series data have shown that such data contain complex autocorrelation profiles, known as long-memory, fractal fluctuations, or 1/f noise. Such autocorrelation profiles are characterized by a less-than-exponential decay of correlation strength with increasing lag. The main hypothesis on the origin of such long-memory is, that it is a result of the non-linear interactions between cognitive or (neuro-) physiological components (such as cells, organ systems, cognitive functions). However, currently available analysis techniques that are used to quantify long-memory, such as spectral-based analysis or detrended fluctuation analysis (DFA), take only univariate data to quantify long-memory. Hence, the first part of this talk presents a new analysis

technique, multidimensional detrended fluctuation analysis (MdDFA), which allows to analyze multivariate time series data. The result of such an analysis is a Hurst exponent H , which quantifies the strength and type (persistent or antipersistent) of long-memory in multivariate time series data. The second part of this talk presents the application of MdDFA to EEG data from a timing study, investigating the effects of accuracy feedback on time interval production and showing how MdDFA can be used to capture global long-memory characteristics in EEG dynamics. In conclusion, MdDFA allows to quantify global or cluster-wise long-memory processes in multivariate data sets, and does so more accurately than combinations of univariate applications, such as simple DFA.

Reward-context effects on working memory: Insight from an EEG-pupillometry study

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Performance has been found to be better when it is rewarded than when not rewarded, leading to a wide use of rewards to increase motivation hence improving performance. However, little is known whether reward-related improvements come at the expense of non-rewarded performance or enhance the proactive control in tasks that are intermittently rewarded. Here, we attempted to conceptually replicate the work of Jimura et al. (2010, PNAS) by combining behavioural-EEG-pupillometry measures in a block-wise design. Participants were asked to perform on a visual working-memory task in blocks containing performance-contingent rewarded trials (R+) and non-rewarded trials (R-) as well as in blocks containing purely non-rewarded trials (NR). With this design, we were able to compare performance in R- and NR trials, thus gaining insight whether performance in the R-trials profited from the reward prospects in the R+ trials (i.e., context effect). Our findings indicated that a context effect was observed in mostly reaction times. Findings from pupillary responses and ERPs further explained the context vs. transient effects especially during the incentive cue, memory task, and performance feedback phases. The implications of the current findings will be discussed.

Naturalistic Stimuli in Cognitive Neuroscience

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The symposium focuses on naturalistic paradigms, such as watching movies or listening to stories, while measuring brain activity with fMRI or M/EEG. The speakers will talk about the usefulness of naturalistic stimuli in neuroscience, introduce free datasets and present results regarding vision and language.

In the first talk, Katerina Kandylaki will introduce naturalistic / ecologically valid experiments in the cognitive neuroscience of language. She will outline the benefits and challenges of such paradigms and briefly explain one fMRI study.

The second talk (Katja Seeliger) will focus on a new public large-scale dataset where a single participant has been exposed to almost 23 hours of naturalistic video and audio, with the motivation of enabling training of modern artificial intelligence models directly on the data.

The third talk (Christian Häusler) will present results that suggest incidental spatial cues given by the narrator of the audio-description (i.e. the audio-only variant) of the movie Forrest Gump can be used to isolate a classic visual area (parahippocampal place area) in individual persons.

In the fourth talk (Martin Wegrzyn), encoding models are used to learn which syntactic features predominantly activate the language network when a person listens to an audio version of Forrest Gump.

The last talk (Phillip Alday) will discuss the challenges and opportunities of extending naturalistic paradigms to M/EEG, where the high temporal resolution provides both incredible opportunities and fundamental challenges for examining the fine structure of stimuli with large and variable temporal extent.

Mapping individual language networks using a naturalistic audio stimulus

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Naturalistic audio stimuli provide an engaging way to elicit cerebral responses with high agreement across participants. In comparison to task-based language fMRI, naturalistic paradigms typically give rise to networks of activation which are more extended and more bilateral. Here, we used data from an audio story to identify a left-lateralized language network in individual participants and to characterize which properties of the stimulus can explain activity in this network.

Nineteen participants listened to an audio version of Forrest Gump in the scanner (studyforrest.org). Using half of the audio stimulus of half of the participants, we used ICA to define a lateralized language network shared between participants. We then tried to characterize the common time course of activity in this network and model its activity for held-out segments of the audio stimulus.

We identified a network comprised of left inferior frontal and posterior temporal areas which emerged in each training run and followed a common time course in different participants. This allowed to lateralize language in one person using other participants' data as a model. Finally, the activity could be approximated by a weighted combination of syntactic features of the stimulus.

The results demonstrate that a classical left-lateralized language network can be derived using naturalistic stimulation. This network can be identified in individual fMRI runs and in individual participants, making it potentially useful for clinical applications. Important next steps will be to test the approach in new participants, including those with atypical lateralization, as well as in clinical settings.

Consequences of prefrontal tDCS on inhibitory control and reactive aggression

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Background: Increased aggressive and impulsive behavior represents a key component of several psychiatric disorders, including substance use disorder, which is often associated with deficient prefrontal brain activation. Thus, innovative tools to increase cognitive control over impulsive and aggressive tendencies are highly warranted in populations that might be prone to engage in such behaviors.

Aim: The current study aims to investigate the potential of transcranial direct current stimulation (tDCS), a powerful tool to modulate cortical activation patterns, to increase inhibitory control in individuals with a high potential for impulsive and aggressive behavior.

Methods: In a double-blind, sham-controlled study, we investigated effects of anodal tDCS over the right dorsolateral prefrontal cortex on aggressive and impulsive behavior. To study populations which might benefit from this intervention, an all-male sample of alcohol dependent patients, chronic tobacco users and healthy matched controls performed a modified version of the Taylor Aggression Paradigm and the Stop Signal Reaction Time Task before and immediately after a single session of tDCS.

Results: While there were no observable effects of tDCS in healthy controls, results revealed altered aggressive behavior in alcohol dependent patients and improved response inhibition in alcohol dependent patients and chronic tobacco users following active but not sham stimulation. Our findings further demonstrated that both groups were characterized by increased impulsive and aggressive traits as compared to healthy controls and by chronic tobacco use.

Conclusion: The study highlights the importance of sample characteristics such as nicotine intake and personality traits for understanding the effects of brain stimulation.

Does interoception contribute to the development of the bodily self? A behavioural and neurophysiological assessment in five- to seven-month-old infants

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Interoception, the perception of internal bodily signals, is fundamental to our sense of self. Even though theoretical accounts suggest an important role for interoception in development of the self, empirical investigations are limited. It has been suggested that development of the self in infants is based on the perception of contingencies between the self and the outside world. This has been informed by studies using preferential-looking paradigms. From birth, infants are able to detect sensorimotor and multisensory contingencies, and thus show a minimal awareness of the self as distinct from others or the world. Recently, a single study reported that infants detect contingencies between interoceptive (cardiac) and audiovisual signals, and that this detection is related to heartbeat evoked potentials (HEP), a neural correlate of interoception. In the current study, we aim to disentangle this contingency detection, by investigating whether there is a difference in looking and grasping preferences between synchronous and asynchronous visuocardiac, and audiovisuocardiac stimuli. Additionally, we measured HEP in response to live and 2-second delayed videos of the infant, as well as videos of emotional (happy and angry) faces. In contrast to a previous study, preliminary data analyses do not show a difference in looking time, nor a difference in HEP amplitude between experimental conditions. This study adds to the growing literature on the role of interoception in early development of the bodily self and will inform about the role of interoception in current theories of development of the bodily self.

Detecting Falsehood Relies on Mismatch Detection between Sentence Components

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How do people process and evaluate falsehood of sentences? Do people need to compare presented information with the correct answer to determine that a sentence is false, or do they rely on a mismatch between presented sentence components? To illustrate, when confronted with the false sentence ‘trains run on highways’, does one need to know that trains do not run on highways or does one need to know that trains run on tracks to reject the sentence as false? To investigate these questions, participants were asked to validate sentences that were preceded by images (Experiments 1-3) conveying a truth-congruent or a falsehood-congruent component of the sentence (e.g., an image of tracks/highway preceding the sentence ‘trains run on tracks/highways’) or by words (Experiment 4) that were either sentence-congruent, truth-congruent, or both (e.g., the word ‘train/tracks’ preceding the sentence ‘trains run on tracks/highways’). Results from four experiments showed that activating sentence-congruent concepts facilitates validation for both false and true sentences but that activating truth-congruent concepts did not aid the validation of false sentences. The present findings suggest that a detection of falsehood relies on a mismatch detection between sentence’s components, rather than on the activation of true content in the context of a particular sentence.

Do I still like myself? Emotional consequences of outsourcing cognitive processing to artificial agents.

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Background: In a technologized world, humans augment brain-based with environment-based cognitive processing (cognitive offloading, CO). Moreover, regarding affect and self-concept, humans see themselves in a positive light which is associated with mental health. Such positive self-concept is known to be sensitive to social comparisons during human-human-interactions. However, little is known about how CO affects it. Objective: This study investigates emotional consequences of CO when interacting with artificial agents (AAs). We expect participants’ emotional self-concepts to change after engaging in CO with an AA that has been described as (1) able or (2) unable to experience emotions, or (3) autonomous without reference to emotional ability, compared to a control condition (4) without CO. Methods: Participants could solve arithmetic problems on their own or offload cognitive processing onto an AA. In addition, participants engaged in an affective evaluation task (affective HisMine-paradigm, aHMP) before and after solving the problems. The aHMP is able to capture emotional self-concept by asking participants to affectively judge pronoun-noun pairs that are related to themselves or another agent (here the AA) via button press. Results: Before problem solving, participants exhibited a self-positivity bias in the aHMP, i.e. judged positive words related to themselves faster and more positively than positive words related to the AA. After problem solving, this bias selectively decreased if participants solved the task with the AA described as emotionally blind. Conclusion: Cognitively interacting with AAs can have consequences for the problem solver’s self-concept. Application: Emotional consequences should be considered when designing interactions with AAs.

Action-effect compatibility in a gaze leading task

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The sociomotor framework assumes that people can control their actions by anticipating the behavior that these actions evoke in other people. Evidence for this claim has been accumulated by several studies investigating the control of manual actions. Recently, some studies have suggested that this idea might also apply to the control of eye movements. A typical example for influencing another person's behavior with one's eyes is a gaze leading situation, in which fixating a certain location triggers another person to look at the same location. In this case, the aimed-at effect (gaze following) is only visible from the corner of the gaze leader's eye. Investigating whether anticipation of gaze following behavior influences the gaze leader's actions therefore constitutes a test for sociomotor control of eye movements. For this test, we combined a response-effect compatibility setting and a gaze leading task in the present study. Participants (n = 60) performed saccades to one of two target objects. Eye movements were followed by an on-screen face which foreseeably looked to the same object (gaze following: compatible condition) or to the opposite side (incompatible condition). Participants initiated saccades faster in the compatible compared to the incompatible condition. This finding suggests that the anticipation of the gaze following behavior of another (virtual) person impacts the generation of own eye movements. The results support the idea that eye movements in a social context might be controlled by codes of another person's behavior.

Masked priming - a window to non-conscious cognition

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Masked priming paradigms are frequently used to elucidate power and mechanisms of non-conscious cognition: In this paradigm, participants categorize visible target stimuli that are preceded by a prime, presented briefly and masked. Despite being non-conscious, the prime influences the response to the target. In this symposium, we give an overview of the latest developments in the research on masked priming and address current challenges. The first two talks deal with a recent attack on the claim of non-conscious priming. By introducing a trial-by-trial prime awareness rating, priming effects seem to be constrained to trials with at least partial prime awareness. In contrast, Wentura found priming effects for subjectively unaware primes, when using the ratings in masked response priming experiments by applying adequate stimulation parameters. Kiefer found in a masked semantic priming experiment that assessing subjective experience interferes with semantic processes underlying masked priming. In a third talk, Rohr compares masked number priming using CRT and LCD screens. They obtained non-conscious priming with both types of screens. Schmidt addresses in the fourth talk the mechanisms underlying the negative compatibility effect. They observed inhibition processes, which are not based on specific prime features. In the fifth talk, Mattler reports priming effects that provide further evidence for dissociable visual processing pathways according to Milner and Goodale. Together, the talks of the symposium give insight into the intricacies of exploring non-conscious cognition with a *prima facie* simple tool, that is, masked priming.

Affective processing does not require awareness. On the use of the perceptual awareness scale in response priming research. Dirk Wentura, Saarland University

Assessing subjective prime awareness on a trial-by-trial basis interferes with masked semantic priming effects. Markus Kiefer, Ulm University

Masked number priming with CRT and LCD monitors: A solid test for the use of LCD monitors in masked visual computer experiments. Michaela Rohr, Saarland University

Response inhibition in the Negative Compatibility Effect in the absence of inhibitory stimulus features. Thomas Schmidt, Technical University Kaiserslautern

Masking effects of forward and backward masks suggest dissociable visual pathways. Uwe Mattler, University of Göttingen

Affective processing does not require awareness. On the use of the perceptual awareness scale in response priming research

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Lähteenmäki, Hyönä, Koivisto and Nummenmaa (2015) introduced new ideas to tackle the old and notorious question whether it can be reliably shown that stimuli, which participants are not aware of, will be evaluatively or semantically processed. Methodologically, they suggested a trial-by-trial subjective rating task (perceptual awareness scale; PAS) administered directly after each masked priming trial to assess awareness of the prime stimulus more directly. They claimed to have found no priming for subjectively unaware primes in two response priming experiments. Beside the superordinate question whether the proposal should in principle be considered a better solution compared to more traditional ones (e.g., a direct prime detection block administered subsequently to the priming block), their experiments can be inherently criticized for deviating from typical masked priming experiments with regard to several details. Therefore, in two experiments we integrated the PAS-rating in a more standard masked priming paradigm. We obtained priming effects even for subjectively unaware primes.

Another Time and Space – Spatial Components in the Mental Representation of Physical Dimensions

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Spatial components in the representation of ordinal information were initially revealed by Dehaene, Bossini and Giraux (1993). The authors found faster left- than right-hand responses to small numbers and a reverse effect with large numbers. This SNARC effect (Spatial-Numerical Association of Response Code) was also found with overlearned and newly learned non-numerical information (Gevers, Reynvoet & Fias, 2003). The current study examined whether physical dimensions are also mentally represented with a spatial component. Response times to mentally visualized clothing of different weight and brightness were analyzed. Subjects were asked to either categorize the items as lighter vs. heavier or brighter vs. darker than a reference. The characteristic interaction of position (before or after the reference) and side of response (left or right) was found with the dimension of weight: left (right) hand responses were faster for lighter (heavier) clothing. Findings suggest that the representation of physical dimensions may also include spatial components.

Specific generalizations: The case of plants

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In this talk I will review recent evidence from studies with infants exploring the kinds of generalization processes involved in learning about plants. Plants have been an essential component of human diets over evolutionary time. Because many plants are toxic, trial and error learning about which plants are edible would be quite costly. Instead, evolutionary modeling work predicts the evolution of social learning strategies. Further, because edible plants can be difficult to discriminate from toxic ones, generalization processes for this learned information should be relatively restrictive.

In the first set of studies, we tested 18-month-old infants (N = 40) to examine whether they generalized socially-learned information about one plant to any other type of plant, or only to other plants that look the same. Infants watched as an adult ate fruits from one type of plant, but not those from a different type. Infants were then given the choice of between the two plant types and reliably chose to consume fruits from the same-type plant. In a second study, we tested whether 18-month-olds' (N = 40) generalization strategies for plants were more conservative than their generalization strategies for feature-matched manmade artifacts. Using a name-extension task, we showed that infants were more restrictive in their generalizations for plants. These results are consistent with a growing body of working suggesting that evolutionary processes have shaped aspects of the human mind to safely acquire information about plants during infancy and early childhood.

Cue-related processing accounts for age differences in phasic alerting

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While younger adults benefit from phasically alerting cues quite consistently, effects of alerting cues in older adults are more diverse. These age differences have been attributed to age-related changes in the brain network underlying alertness and cognition.

First, we present an empirical study that investigated neural correlates of adult age differences in phasic alerting effects on visual attention. Participants performed a partial letter report task, in which half of the visual stimulus displays were preceded by an auditory warning cue. We measured attentional parameters based on the Theory of Visual Attention and electroencephalography (EEG) time-locked to the cue and time-locked to the stimulus.

Only younger adults showed an alertness-related increase in the parameter visual processing capacity and a latency reduction of the stimulus-related visual event-related lateralizations (ERLs), indicating faster stimulus processing in the visual stream. By contrast, older adults, on average, did not benefit from the alerting cue. The EEG time-locked to the alerting cue showed a strong increase in power and phase-locking in both age groups. Interestingly, the cue-related response was even stronger in older than younger adults and was negatively correlated with the behavioral alerting effect in the older group. These findings suggest that older adults benefit less from alerting cues than younger adults, if their neural response is strongly driven by the cue and, thus, hinders the effective use of the warning signal to foster processing of the following stimulus.

Second, in a metanalytic review, we follow up on this by investigating the task factors that impact the relationship between aging and phasic alerting effects across various cognitive tasks.

Sicherheit auf den ersten Blick? Einfluss externaler Mensch-Maschine-Schnittstellen hochautomatisierter Fahrzeuge auf Fußgänger

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Die Entwicklung hochautomatisierter Fahrzeuge (AV) und ihre Integration in den Straßenverkehr werden von vielen Automobilherstellern als eine Revolution der Mobilität angesehen. Diese neue Art der Mobilität wirft jedoch Fragen hinsichtlich der Interaktion mit ihrer Umwelt auf. Unabhängig von einem menschlichen Fahrer, müssen sich AVs sicher im Straßenverkehr bewegen und mit Verkehrsteilnehmern in ihrer Umwelt kommunizieren können. In Forschung und Entwicklung werden hierfür externaler Mensch-Maschine-Schnittstellen (eHMI) als Lösung diskutiert. Neben positiven Effekten des eHMI müssen jedoch auch mögliche negative Effekte bezüglich der Verkehrssicherheit betrachtet werden. Am Beispiel eines die Straßenseite wechselnden Fußgängers im urbanen Kontext untersucht die vorliegende Experimentalstudie mögliche Effekte von eHMIs bei hochautomatisierten Fahrzeugen. Dabei stehen neben dem Entscheidungszeitpunkt und der Entscheidungssicherheit ebenfalls die Häufigkeit der Blickkontrolle zur Absicherung der Straßenüberquerung im Fokus. 52 Probanden überquerten in einer VR-Studie eine Straße mit gemischtem Verkehr, der nicht automatisierte Fahrzeuge sowie automatisierte Fahrzeuge (mit vs. ohne eHMI) beinhaltete. Die Ergebnisse der Untersuchung zeigen, dass Probanden sich beim Überqueren der Straße in ihrer Entscheidung signifikant sicherer fühlten, wenn das AV mit einem eHMI ausgestattet war. Zusätzlich überquerten sie bei diesen Fahrzeugen signifikant früher die Straße. Zwischen den unterschiedlichen Fahrzeugen unterschied sich die Häufigkeit der Blickkontrolle jedoch nicht signifikant. Insgesamt wird deutlich, dass sich AVs mit einem eHMI von anderen Fahrzeugen in einem gemischten Verkehr durch die Darbietung zusätzlicher Informationen abheben; ein negativer Einfluss des interagierenden eHMIs auf die Häufigkeit der Blickkontrolle konnte nicht nachgewiesen werden. Implikationen für eine ganzheitliche Evaluation von eHMI sowie deren sichere Einführung in den Straßenverkehr werden diskutiert.

Usability of Predictive Policing for fighting road traffic crashes: An explorative study

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Approximately 1.35 million people are dying annually because of road traffic crashes worldwide, and, after years of decline, the numbers of road fatality in the European Union are stagnating (WHO, 2018). This lack of decrease calls for new strategies in road traffic safety. Predictive policing might be one of them if the likelihood of crimes, and road traffic crashes and dangers can be predicted with this advanced policing strategy (cf. the project DDACTS in the USA). In general, the strategy uses information from past crimes and advanced analysis to inform forward-thinking crime prevention, especially in domestic burglaries. This paper focuses on the question whether Predictive Policing can be usefully transferred to the context of road traffic safety from a practitioner's perspective. Using an explorative approach, three focus group discussions were conducted, including 17 participants. Participants were police officers from Germany working in road traffic safety or crime prevention and the use of predictive approaches. Results indicate that underlying theoretical concepts, such as identifying vulnerable areas or risk terrains, apply to the road traffic safety context. On the other hand, participants focused the unpredictable nature of road traffic accidents, as they do not result from planned behavior or a rational decision, which might impede a prediction. Employing these results,

several predictors for traffic accidents are deducted and integrated. Finally, practical implications for the prevention of traffic accidents as well as further research needs are derived.

Pronunciation-based Adaptive Word Learning

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Storing representations of words in declarative memory is an important aspect of formal foreign language learning. Because memorizing words is tedious and effortful, advancements in cognitive psychology and educational data mining have led to the development of digital adaptive learning systems that make learning more efficient. These systems measure learning performance in real time to create optimal study strategies for individual learners. While this approach has been successful at improving written word learning, technical challenges of automatic pronunciation assessment have largely prevented the scientific examination of speech-based adaptive word learning. Here we show that it is possible to successfully apply adaptive learning algorithms that were developed for typing-based learning to speech-based learning. By making use of automatic multi-modal pronunciation assessment, a method that combines audio and video data to compute a speaker's quality of pronunciation, we also demonstrate that pronunciation scores predict learning performance and that they could be used to further improve existing adaptive learning algorithms. These findings contribute to a better understanding of the memory processes involved in pronunciation-based word learning and can also inform the development of educationally relevant language learning applications. Such applications are valuable because they focus on what may be the most important aspect of language learning: to practice speech. In addition, speech-based adaptive learning systems can allow for effective word learning even when learners lack the ability or opportunity to read and type, which makes them applicable in a wide range of educational settings.

Concurrent visual sequence learning

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Keele et al. (2003) had supposed that implicit learning is based on encapsulated modules processing information within single dimensions. However, it is not clear, whether these dimensions refer to modalities (visual, auditory perception) or to distinct features (location, color, shape, etc.). The findings of Eberhardt et al. (2017) suggest the latter by showing that a stimulus-color sequence can be learned concurrently with a stimulus-location sequence. Since location might be a special feature, our aim was to test whether this also holds true for other non-spatial features within the visual modality. Conway and Christiansen (2006) had already shown that this might be true for colors and shapes. In our first experiment, we replicated the statistical learning experiment of Conway and Christiansen. To further examine the findings, we investigated concurrent learning of two visual sequences with another paradigm. By means of a serial reaction time task we showed concurrent color and shape sequence learning, i.e. concurrent learning of multiple sequences within the visual modality. Thus, we argue that the term 'dimension' of Keele et al. (2003) refers to abstract features rather than to modalities.

Localizing Modality Compatibility Effects: Evidence From Dual-Task Interference

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Performance is typically superior with modality-compatible stimulus–response sets (e.g., responding vocally to auditory stimuli and manually to visual stimuli) than with modality-incompatible sets (e.g., responding vocally to visual stimuli and manually to auditory stimuli). Here we studied the information-processing stage at which these modality compatibility effects arise. In experiments using a dual-task setup, we demonstrated that these compatibility effects arose (at least partly) prior to a capacity-limited central stage that is commonly believed to be the origin of dual-task costs. We suggest that demands to employ a specific effector system bias perceptual processing toward effector-compatible stimulus modalities.

How we generalise across colours to communicate and recognise objects

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In our everyday life experience, colour feels like a raw material property, void of any abstraction and interpretation. Yet, a seemingly simple observation, such as “leaves are green”, implies several kinds of generalisations: (1) across the variation of colour within the object (here: within a specific leaf); (2) across different instances of that object (e.g., across kinds of leaves); (3) across lighting conditions (e.g., bluish daylight vs yellowish indoor lighting); (4) and across different shades of colour described by that colour term (e.g., all shades of green between chartreuse and teal). For object colours (1+2), there is evidence that human observers focus on specific aspects of the colour distribution and neglect others. For example, we recently found evidence that observers focus on a “dominant hue” that is most representative of an object’s variation in colour. Observers also have specific expectations about colour changes under natural lighting conditions (3), as illustrated by #theDress. These expectations allow us to reliably recognise object colours. Finally, the colour categories that correspond to basic colour terms (4) can neither be explained by the perceptual dimensions of colour vision, nor by language alone. Recent studies indicated that children’s ability to abstract from colour variation within categories and across illumination is related, suggesting that both, colour constancy and colour naming, rely on shared processes of abstraction and generalisation. More generally, these different types of generalisation suggest that generalisation and abstraction adapt colour perception and categorisation for the purpose of recognising objects and materials under changing viewing conditions.

Relationship between bullying experience and the electrophysiological correlates of social exclusion: ERP findings using the Cyberball paradigm

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Bullying, particularly the experience of social exclusion, can have serious negative consequences on mental health. For example, previous research has shown that victims of bullying responded more sensitively to being excluded despite a single experience of social exclusion. As little is known about neural processing of social exclusion, we investigated the electrophysiological correlates of social exclusion depending on the bullying experience. Associations between individual bullying experience, sensitivity to rejection and depressive Symptoms were of interest as well. We examined 60 female participants aged between 18 and 29 years. The participants played a virtual ball-tossing game

(Cyberball paradigm) into which they were first included and then excluded, while we measured their event-related brain potentials (ERP). Participants with a history of bullying experience had higher values for rejection sensitivity and there was a positive correlation between the experience of bullying and the extent of their depressive symptoms. Compared to the participants without any experience of being bullied, participants with that experience showed a lower P2-amplitude in the inclusion condition (relative to exclusion). Furthermore, the extent of bullying experience was negatively related to P2 amplitude in the exclusion condition. Our results suggest that persons with bullying experiences show reduced attention in social interactions and seem to emotionally withdraw from social situations.

Competition between salient objects and central fixation bias in visual selection over time

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Humans scan their visual environment using saccade eye movements. Where we look depends on top-down factors like our behavioral goals and bottom-up factors like object salience. The contribution of salience to oculomotor selection is particularly strong for early saccades. This temporal dependency is also true for the central fixation bias, i.e. the tendency to attend to the center of images. This central fixation bias is thought to arise from the distribution of saliency in images and/or because the center provides a strategic advantage when starting to explore images. Here, we reveal the contribution of object salience and central fixation bias to visual selection over time. We created a database of 25 images, each showing one isolated salient object on a structured background. During the experiments, we showed a subregion of these images to create an offset between object and image center. We measured saccades towards these images in different conditions in which participants were instructed to look (i) at the image center, (ii) at the salient object or (iii) at a cued position halfway in-between the two. Results showed that early saccades, depending on condition, were biased towards salient objects as well as towards the image center. The saliency bias, however, was stronger than the central fixation bias and overruled the latter when they directly competed for visual selection. Yet, these results reveal that there is an early automatic contribution to the central fixation bias that goes beyond strategic exploration behavior or the distribution of salience in an image.

Disentangling the Effects of Spatial Attention From Task Relevance and Perceptual Load on Early Visual Processing in V1: An EEG Study

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Whether or not top-down factors influence the first stage of processing in the primary visual cortex (V1) as indexed by the electrophysiological C1 component could depend on the type of attention process under scrutiny. To test this assumption, in this study we compared effects of spatial attention, task relevance, and perceptual load on the C1, using a factorial design. The C1 evoking stimulus was always shown in the lower visual field, and was either spatially attended or not, was either task relevant or not, and was associated with either low or high perceptual demands across different blocks. 64-channel EEG was recorded in 45 participants while their gaze position was monitored using eye-tracking. Results showed that spatial attention influenced the C1, whereas perceptual load and task relevance did not. However, a control analysis showed that the effect of spatial attention on the C1

was conflated by a systematic shift in gaze position. Our results suggest that spatial attention could influence the earliest stage of processing in V1 irrespective of task relevance and perceptual load, yet this effect could be amplified by eye movements.

Generalisation guided exploration in spatial, abstract, and structured domains

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How do people learn in real-world environments where the space of possible actions can be vast or even infinite? The study of human learning has made rapid progress in past decades, from discovering the neural substrate of reward prediction errors, to building AI capable of mastering the game of Go. Yet this line of research has primarily focused on learning through repeated interactions with the same stimuli. How are humans able to rapidly adapt to novel situations and learn from such sparse examples? I propose a theory of how generalization guides human learning, by making predictions about which unobserved options are most promising to explore. Inspired by Roger Shepard's law of generalization, I show how a Bayesian function learning model provides a mechanism for generalizing limited experiences to a wide set of novel possibilities, based on the simple principle that similar actions produce similar outcomes. This model of generalization generates predictions about the expected reward and underlying uncertainty of unexplored options, where both are vital components in how people actively explore the world. This model allows us to explain developmental differences in the explorative behavior of children, and suggests a general principle of learning across spatial, conceptual, and graph-structured domains.

Source Memory

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Source memory – the ability to remember contextual details of information – is a fascinating cognitive process that is, for instance, essential for making inferences about the credibility of information. This symposium will bring together six researchers who will present recent evidence obtained from various research questions about source memory within a joint theoretical framework. First, Tanyas, Misirlisoy, and Kuhlmann report research demonstrating how the type of source presentation and the test format can affect source monitoring processes. In the second talk, Hey, Schaper, and Bayen demonstrate that the metamemory expectancy illusion influences both metamemory control and source memory. Two talks address the influence of emotions on source memory: Symeonidou and Kuhlmann present research on how emotional context features can affect source memory. Kroneisen presents work addressing the impact of a person's emotional state on source memory for happy and sad facial expressions. Following this, Bell, Mieth, and Buchner report recent work examining how high exposure to information from untrustworthy sources in the domain of advertising affects source monitoring. Wulff and Kuhlmann conclude this symposium by specifically focusing on source guessing – another cognitive process on which source attributions can be based whenever source memory is lacking.

Lacking source memory: Biased source guessing based on pre-experimental knowledge?

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Stereotypes and schemas impact source-monitoring processes – the ability to infer the origin of information. One mechanism of this influence is biased source guessing which reflects strategic context reconstruction when lacking memory for it. In the present study, we examined whether guessing based on schematic expectations about sources can be described as a trait-like feature within individuals. Therefore, participants performed two study-test cycles of a source-monitoring task – a scene and a profession paradigm. In each task, participants learned information (scene: object words; profession: statements) that was either expected or unexpected for the accompanying source (scene: bathroom or kitchen; profession: doctor or lawyer). In the test phase, participants attributed the previously-learned information among distractors to its origin. We estimated source-monitoring processes via Bayesian-hierarchical multinomial processing tree modeling. Whereas participants on the group level predominantly showed schema-based source guessing in both paradigms, correlations of exactly these source-guessing parameters indicated rather weak cross-task stability. That is, the strength of schema-based source guessing in one paradigm had only little predictive power of participants' guessing behavior in the other paradigm, as did also source memory. In contrast to this, memory for the information itself and guessing the old versus new status of information was highly stable across paradigms. In line with previous work (Wulff & Kuhlmann, 2020), we thus demonstrate that attributing information to its associated schematically-expected or -unexpected source is mostly susceptible to situational determinants, whereas the ability to classify information per se – unbound by contextual details – as old or new largely mirrors trait-like stability.

How guilt guides behavioral responses to environmental warnings

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In response to the broad scientific and societal consensus about humanity's shared responsibility to mitigate climate change, warnings about excessive green-house-gas emissions and its associated risks have been an important pillar of demand-side mitigation targeting individuals' energy-related behaviors. However, little is known about how people react to such warnings on a behavioral, cognitive, and affective dimension and about how these dimensions interact. To address this lacuna, we conduct a highly controlled study that examines the impact of warnings in a threshold public game, in which members of a social group can harvest resources from a common pool while risking collective over-exploitation that causes an actual CO₂ externality. Our findings show that that experienced guilt – but not worry, anger, powerlessness, or hope – is predictive of a sustainable response to the warning. Additionally, we find that many people base their behavior on their expectation about how group members will react. Importantly, however, we find that people who endorse high environmental values and who experience a high level of guilt, reduce their harvesting rates irrespective of what they believe that others do. Our results highlight the importance of a joint investigation of affective, cognitive, and behavioral consequences to warnings and suggest that self-conscious emotions may be a crucial psychological path to regulating large-scale common goods such as environmental sustainability.

Is there a G-factor in hypnotizability? Evidence from Structural equation modeling of Harvard group scale of hypnotic susceptibility

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Undisputedly, there are big Individual differences in responding to hypnotic and posthypnotic suggestions. However, understanding hypnotizability is more contentious. The existing standardized measures of “hypnotic susceptibility” are not measuring hypnotizability per se, but instead, a combination of suggestibility (i.e., the ability to respond to suggestions independent of hypnosis) and hypnotizability (i.e., the increased in suggestibility due to hypnosis induction). Previous exploratory factor analysis (EFA) of these standardized scales found them to be heterogeneous. However, the number and nature of the latent factors are a matter of debate. Here, we investigated the Harvard group scale of hypnotic susceptibility (HGSHS) scores obtained from 477 volunteers, employing confirmatory factor analysis. Several models were tested, most importantly a nested three-factor model, corresponding to previous results from EFA, and a bifactor model based on a novel theory of hypnosis, that is, the simulation-adaptation theory (Zahedi & Sommer, in prep). HGSHS scores were best explained by the bifactor model consists of a G-factor tapping into hypnotizability and three specific grouping factors measuring different components of suggestibility, that is, simulation, simulation-adaptation, and executive function. Further, structural equation modeling of causal pathways between latent factors revealed that the outcome of the suggestions, requiring a balanced interaction between cognitive-simulation and sensory-adaptation, can predict the responses to other suggestions. Consequentially, our results demonstrate (1) the necessity of developing a new scale of hypnotic susceptibility, focused on simulation-adaptation suggestions for clinical applications, and (2) revisiting applications of traditional standardized scales in experimental studies.

The Jena Voice Learning and Memory Test (JVLMT): A standardized tool for assessing the ability to learn and recognize voices

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The ability to recognize someone’s voice spans a broad spectrum with phonagnosia on the low end and super recognition at the high end. Yet there is no standardized test to measure the individual ability to learn and recognize newly-learned voices with samples of speech-like phonetic variability. We have developed the Jena Voice Learning and Memory Test (JVLMT), a 20min-test based on item response theory and applicable across different languages. The JVLMT consists of three phases in which participants are familiarized with eight speakers in two stages and then perform a three-alternative forced choice recognition task, using pseudo sentences devoid of semantic content. Acoustic (dis)similarity analyses were used to create items with different levels of difficulty. Test scores are based on 22 Rasch-conform items. Items were selected and validated in online studies based on 232 and 454 participants, respectively. Mean accuracy is 0.51 with an SD of .18. The JVLMT showed high and moderate correlations with convergent validation tests (Bangor Voice Matching Test; Glasgow Voice Memory Test) and a weak correlation with a discriminant validation test (Digit Span). Empirical (marginal) reliability is 0.66. Four participants with super recognition (at least 2 SDs above the mean) and 7 participants with phonagnosia (at least 2 SDs below the mean) were identified. The JVLMT is a promising diagnostic tool to screen for voice recognition abilities in a scientific and neuropsychological context.

Unconscious priming: Should scientists use continuous direct measures?

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A frequently used paradigm to investigate unconscious processing is the masked priming paradigm. Traditionally, a direct task is compared to an indirect task. In the direct task, detection of a masked prime stimulus is measured, typically being close to chance. In the indirect task, effects of the prime on reaction times to a subsequent target stimulus are analyzed (priming effects). Here, we focus on the direct task, where participants usually provide a binary response. In a previous experiment we have shown that confidence covaried with the accuracy of prime detection in number discrimination tasks, suggesting that participants have access to a richer, continuous representation of the prime in the direct task and therefore should not be restricted to a binary decision. To assess whether this remains true for different sets of stimuli, N=11 participants performed the masked priming paradigm with simple line stimuli that were horizontally or vertically oriented. Participants classified the orientation of the prime (direct task) or of the later target stimulus (indirect task). Additionally, in the direct task, participants judged their confidence in their response on a continuous scale. We found that confidence covaried with the accuracy of prime detection ($F(1,10)=14.0, p=.004, \eta^2=.58$), with higher accuracies of prime detection for trials with higher confidences. We discuss to which extent continuous direct measures open up new analysis strategies and why they might be favorable for the investigation of unconscious priming. [This project is supported by the Deutsche Forschungsgemeinschaft (DFG, German Research Foundation) through the CRC1233 "Robust Vision", project number 276693517]

Nonprobative photos inflate truth perceptions: Illusion of evidence or processing fluency?

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Claims are more likely to be judged true when presented with a related nonprobative photo. This robust effect may reflect (1) that related photos facilitate processing and easy processing fosters acceptance of the claim or (2) that related photos are treated as tentative supportive evidence, which may also increase acceptance of the claim. Both accounts make the same predictions for non-comparative judgments, but differ in their predictions for comparative claims. When forming comparative judgments, people first assess attributes of the linguistic subject of comparison and subsequently compare them to attributes of the referent. Photos of the linguistic subject of the sentence should facilitate processing of this sequence, whereas photos of the linguistic referent should impair it. In contrast, a photo of either the subject or the referent can be perceived as tentative evidence. In two experiments (total N = 1200), photos of the subject increased acceptance of comparative claims relative to a no-photo condition (a truthiness effect), but only when the subject was otherwise difficult to visualize. Photos of the referent decreased acceptance of comparative claims relative to a no-photo condition (a falsiness effect), but only when the subject was otherwise easy to visualize. Throughout, increases in fluency fostered, and decreases in fluency impaired, acceptance of a claim as true, supporting a fluency account and providing no evidence for an illusion-of-evidence account.

Learning competence on text-picture integration: Learners with low prerequisites tend to give up early

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We examined the influence of learners' reading competence on the pattern of using text information and picture information. Children (N = 144) from secondary schools were recruited from grade 5 (Mage = 11.4, SD = 0.6) and grade 8 (Mage = 14.5, SD = 0.7). They read multimedia materials under question-with-material condition and question-before-material condition. Using the survival analysis, this study suggested that 5th graders (with relatively low learning prerequisites) tended to give up earlier than 8th graders (with relatively high learning prerequisites) prior to the incorrect responses to a question. The ones who gave up early and gave incorrect answers had spent neither enough time on texts to establish the mental model nor enough time on pictures to adapt the mental model to the task demand. Inappropriate approach of integrating texts and pictures can thus be a reason for early giving up prior to incorrect answers. Instructional design should thus emphasize on the needs of individuals with low learning prerequisites to support text-picture integration and further to avoid early giving up.

"I can see clearly now" – Visual Coherence Impacts Judgments of Learning (JOLs)

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When people are asked to judge whether a fragmented line drawing depicts a meaningful object (coherent fragment) or not (incoherent fragment), they can do so above chance without recognizing what the object is. In the present study, we examined whether visual coherence affects predictions of future memory performance (judgments of learning; JOLs). Furthermore, we investigated the hypothesis that effects of visual coherence on JOLs are due to differences in perceptual fluency, that is, the ease of perceiving fragments. In three experiments, participants saw coherent and incoherent fragments, made JOLs for each fragment, and took a recognition test. In all experiments, JOLs were higher for coherent than for incoherent fragments and recognition memory tended to be better for coherent than for incoherent fragments. When studying was self-paced, study times were shorter for coherent than for incoherent fragments, suggesting that coherent fragments were processed more fluently than incoherent fragments (Experiment 2). Moreover, JOLs were higher for fragments presented with a high figure-ground contrast than for fragments presented with a low figure-ground contrast (Experiment 3). In summary, the present study revealed that perceptual fluency underlies the effect of visual coherence on JOLs. These results provide important evidence for the perceptual fluency hypothesis and support the view that JOLs rely on non-analytic, experience-based processes.

Physiological correlates for learning with decorative pictures

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Decorative pictures, as opposed to instructional pictures, are pictures that contain no learning-relevant information, thus serving primarily aesthetic functions (e.g. Lenzner, Schnotz & Müller, 2013). Oftentimes considered within the framework of the seductive detail effect, the learning effects of decorative pictures are still being debated (e.g., Chen & Latham, 2014; Harp & Mayer, 1998; Magner, Schwonke, Aleven, Popescu & Renkl, 2014; Rey, 2012; Schneider, Nebel, Beege & Rey, 2018).

Two experiments, differing only in their respective learning text, with a total number of 160 university students for each experiment were conducted. The pictures were manipulated in their degree of valence (positive vs. neutral) and anthropomorphization (human vs. non-human). Both experiments utilized a 2x2 between-subjects design with a control group (no pictures). The students' learning performance was measured with twenty questions, each designed to fit the respective learning text. There were ten questions for retention as well as transfer performance. Three open questions at the very beginning controlled for the students' prior knowledge.

The degrees and changes of the students' intrinsic motivation (SIMS; Guay, Vallerand & Blanchard, 2000), emotion (PANAVA-KS; Schallberger, 2005), as well as mental effort and mental load (Krell, 2015) were being investigated as additional variables. During the learning phase, the students' heart rate (HR) and electrodermal activity (EDA) were being recorded as potential correlates for mental load and emotional valence. The final results of these two experiments that are part of a larger project funded by the German Research Foundation (DFG) are being presented on the conference.

Using predictive cue information for spatial orienting is affected by opposite tendencies of attracting and diverting attention elicited by fear- vs. disgust-related cue content

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Previous studies of spatial orienting with non-predictive peripheral cues (i.e., random contingency of cue location and target location) demonstrated a reversed cueing effect (i.e., slower responses to targets presented at the cued location as compared to the opposite location) for disgust-related cues, suggesting that spatial attention tends to be diverted by disgust-related stimuli. To investigate whether this exogenous emotional impact can be overrun by top-down (expectancy-based) control of attention, we contrasted predictive and counterpredictive peripheral spatial cueing (i.e., presenting the target in the location of the cue vs. in the opposite location with likelihood ratios of 75%/25% and 25%/75%, respectively) for disgust-related vs. fear-related cues. Photographs of faces with disgusted or fearful expression served as cues. Results showed that responding was generally faster when the cue occurred in the likely location than in the unlikely location. In the counterpredictive condition, this “cue validity effect” was larger for disgust-related cues than for fear-related cues, yielding a significant three-way interaction of predictive/counterpredictive condition, validity (i.e., target occurring in the likely vs. in the unlikely location), and emotional content of the cue in the reaction time data. These results are in line with previous findings suggesting tendencies of attracting or holding vs. diverting of attention for fear-related and disgust-related stimuli, respectively, and suggest emotion-based limitations of flexible usage of emotional cues for attentional orienting.

What is the arousal stimulation effect? – The facilitating effects of threat-related stimuli on visual search performance

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Recent publications argue that the assessment of attentional biases for threat is now in crisis as concerns had been raised about the reliability of the measures used. Here, we present our paradigm that provides an opportunity to measure both short term (e.g. orientation, attentional draw) and longer-term (e.g. executive attention, vigilance-avoidance) processes.

Participants (N=53) saw a number matrix (numbers from 1 to 10) in the centre of the screen preceded by an image (prime) that was presented for only a short time (100ms or 250ms). Images could be neutral, moderately or highly threatening. The task was to find nr1 and then find the rest of the numbers in ascending order. We analysed the reaction time (RT) of finding nr1 and the elapsed time between finding nr1 and nr10.

Regarding finding nr1, our results showed that when the priming stimulus is presented for a longer time, threatening pictures produced slower RTs compared to neutral ones, but this effect was offset with an increase in arousal. In contrast, for the overall search performance, the more threatening an image was, the faster the participants completed the task. We did not find any significant effects for the shorter onset time.

This suggests that the arousing nature of threatening stimuli can compensate for the attention-grabbing effect of such stimuli by increasing cognitive capacity and thus leading to a speeded search performance over time.

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