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 fexible 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 Nachwuchs-wissenschaftlerinnen (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 Abado[1], Tatjana Aue, Jan De Houwer, Hadas Okon-Singer

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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?

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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

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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. Moreoever, 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

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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

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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 demostrate 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.

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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

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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 Altgassen[1], 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

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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

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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 GABAAreceptor, 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 administrated 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 imparing response inhibition.

The role of action-specific predictions on perception

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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 Arikan[1], 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 menschzentrierter 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 menschzentrierten 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-Einparkszenario 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 t0 were especially pronounced in unmasked priming, suggesting additional conscious processes to be involved in the t0 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 references 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.