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edited by
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Thomas Goschke, Annette Bolte, Clemens Kirschbaum



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Keynote Lectures

Keynote Lecture I - Monday, March 27

What causes the capacity limit of working memory?

Klaus Oberauer (University of Zurich)

Working memory – the system holding representations available for processing – has a severely limited capacity. What causes this capacity limit? I will review the evidence for the three principal theoretical contenders that vie to explain why and how the capacity of working memory (WM) is limited: Time-based decay, limited resources, and interference. The review will cover two research traditions. In the older tradition, concerned with immediate serial recall of lists (i.e., simple and complex span tasks), decay-based theories and interference-based models are the main contenders. Experimental evidence shows that memory for verbal lists does not decay, whereas an interference model of list memory accounts well for a large range of data. In a more recent tradition, concerned with immediate memory for visual arrays, the theoretical debate concentrates on varieties of discrete and continuous resource models. I will present a new interference-based model of working memory for visual information, and show that it performs better than these resource models. In conclusion, principles of interference apply to the main experimental paradigms in both research traditions, and go a long way towards explaining the capacity limit of working memory.



Keynote Lecture II - Tuesday, March 28

Dissecting the Social Brain through Development, Psychopathology and Plasticity

Tania Singer (Max Planck Institute for Human Cognitive and Brain Sciences, Leipzig)

The relatively new field of Social Neurosciences investigates how people understand and relate to each other. Thus far, at least two different routes on the understanding of others have been described: an affective-motivational route referring to our ability to feel with (empathy) and for (compassion) another person, and a more cognitive route allowing to infer other people's intentions, beliefs, and thoughts. The latter is also called Theory of Mind, mentalizing or cognitive perspective taking. Furthermore, people tend when projecting their own cognitive or affective states onto others during mentalizing or empathizing processes to judge the states of other people egocentrically, assuming that others will feel or think similar to them. Such cognitive or emotional egocentricity bias (EEB) occurs frequently in situations when others feel or think very differently to oneself. During my presentation, I will introduce and define the above-mentioned concepts and describe different neuronal routes underlying socio-affective (e.g., empathy and compassion) versus socio-cognitive processes (e.g., Theory of Mind) as well as our ability to overcome emotional versus cognitive egocentricity bias. Further, I will show how these two routes of social understanding develop during ontogeny and can dissociate in psychopathology such as autism. During the second part of my talk, I will present evidence for plasticity of the social brain based on the ReSource Project, a large-scale interdisciplinary one-year mental training project that aims at the cultivation of (1) attention and interoceptive awareness, (2) meta-cognition and perspective taking on self and others, and (3) empathy, compassion and prosocial motivation by means of three distinct training modules in more than 200 training subjects. I will present first training-module specific findings suggesting malleability of the social brain on the level of behavioral markers of attention, compassion and theory of mind, functional and structural brain plasticity, prosocial behavior and stress reduction and discuss their relevance for models of social cognition and society.



Keynote Lecture III - Wednesday, March 29

New approaches to volition and agency

Patrick Haggard (University College London)

We feel we decide for ourselves what to do. We also feel that our decisions and intentions lead to our physical actions. Indeed, our culture and society seem to be built upon a concept of individuals as autonomous, conscious, responsible agents. However, neuroscience has often struggled with the idea of voluntary action. One key problem for mechanistic accounts of volition arises in trying to define the origin of voluntary actions in the brain. Further, few neuroscientific accounts have captured the "sense of agency" that characteristically accompanies human goal-directed action. I will report recent experimental work that attempts to tackle both of these problems. I hope to show that intentional action is a neural mechanism in the human brain, and that it can be studied experimentally.



Contributions (in chronological order)

Symposium: New trends in cognitive modeling (Part I)

Time: Monday, 27/Mar/2017: 8:40am - 10:00am · *Location:* HS 401
Session Chair(s): Thorsten Pachur, Henrik Singmann

Seek and find in the social mind: Modeling the development of instance-based inference

Christin Schulze, Thorsten Pachur, Ralph Hertwig

Max Planck Institute for Human Development, Germany

Myriad choice situations require people to gauge the relative frequency of events in the world. One way to make inferences about event frequencies in the population is to search for relevant instances in one's personal social network stored in memory. Research on adult cognition has garnered much insight into the specific mechanisms that guide search in and retrieval from mnemonic sample spaces. Results suggest that people often restrict search to directly experienced instances in their social circles and that these social circles are searched sequentially. But how does search for information in the social mind develop ontogenetically? Do already children exploit their social memories to draw inferences about the frequency of events in the world? And if so, how much do they sample, which social spaces do they consider, and how do they integrate the information?

We took a Bayesian hierarchical latent-mixture modeling approach to address these questions. In a study, children and adults were asked to judge the relative frequency of common first names in Germany and, subsequently, to recall how many people with each of these names they knew personally. Based on these recalled instances of names in their social network, we modeled participants' frequency judgments and the underlying search behavior with a generalized process model. This model allows us to measure participants' preferred search order, their evidence threshold, and the noisiness of their inferences. We found striking developmental differences in participants' inference strategies: Compared to adults, children searched more broadly and more exhaustively for relevant instances, and they preferred to search their social circles in a different order. Our approach highlights the benefits of Bayesian hierarchical mixture modeling to illuminate developmental differences in cognitive search and decision processes.

Mapping the unknown: model-based and model-free approaches towards spatial reinforcement learning

Charley M. Wu¹, Eric Schulz², Maarten Speekenbrink², Jonathan D. Nelson¹, Björn Meder¹

¹Adaptive Behavior and Cognition, Max Planck Institute for Human Development; ²Department of Experimental Psychology, University College London

How do people adaptively search for resources in unfamiliar environments? Is search behavior guided by a mental map of the world, and if so, which cognitive models best describe this process? We adapt the multi-armed bandit framework to investigate how people sequentially search unknown environments, where rewards are spatially correlated. The task was represented by a two-dimensional grid with 121 different options. We compared search behavior across different payoff structures (average reward or

largest reward), search horizons (20 or 40 clicks), and types of environments (smooth or rough). Our results show that participants adapt to the assigned payoff structure, balancing both exploration and exploitation when the goal is to maximize average rewards, and prioritizing exploration when the goal is to uncover the largest reward. Surprisingly, participants did not achieve higher average rewards when given longer search horizons. To model search behavior, we considered both local and global models of learning. We describe local learning using a Kalman filter as a type of associative learning model that learns the rewards of each arm independently, and describe global learning using Gaussian Process regression, which we use as a non-parametric Bayesian model of how people form beliefs about the world. We combine each learning model with one of three different decision models, which convert beliefs about the expectation and attached uncertainty for each option into predictions about where a participant will click next. Using cross-validated maximum likelihood estimates, we find that human search behavior is best described as making global but very limited inferences about unexplored regions, combined with a search strategy that explicitly trades off between exploiting high expected rewards and exploring to reduce uncertainty.

Older but bolder? Linking computational modeling and attentional measures to understand age differences in risky choice

Thorsten Pachur¹, Michael Schulte-Mecklenbeck²

¹Max Planck Institute for Human Development, Germany; ²University of Bern, Switzerland

Decision making under risk requires an evaluation of payoff and probability information and is known to tap into various cognitive and affective resources. How are risky decisions affected in older age? We asked a group of younger (mean age 24 years) and older (mean age 69 years) adults to indicate their preferences on a large set of monetary lottery problems (in the gain, loss, and mixed domain). The older adults' risky choices differed from those of the younger adults in two main ways: they showed a) lower decision quality and b) lower (higher) risk aversion in the gain (loss) domain. To examine the psychological underpinnings of these age differences, we combine computational modeling with cumulative prospect theory and process tracing with the Mouselab methodology. Cumulative prospect theory allows to decompose individual differences in observed choice into latent psychological constructs such as outcome sensitivity, loss aversion, probability sensitivity, optimism/pessimism, and response noise. In previous work, we have shown that variability on these constructs is related to variability in regularities in attention allocation during predecisional search, as measured with Mouselab. For instance, participants with higher loss aversion tend to spend more time processing loss outcomes relative to gain outcomes, and participants with lower probability sensitivity tend to spend less time processing probability information. In the present work, we show how the age differences in decision quality and risk aversion map onto age differences in CPT's parameters (e.g., probability weighting, response noise) and examine to what extent the latter are linked with younger and older adults' attention allocation. Our approach demonstrates how latent psychological constructs estimated with computational modeling can be meaningfully related to regularities in cognitive processing.

Quantum cognition quo vadis? A classic-probability account of mirrored order effects in human judgments

Henrik Singmann¹, David Kellen², William H. Batchelder³

¹University of Zurich, Switzerland; ²Syracuse University, USA; ³University of California, Irvine, USA

Using a large data corpus, Wang, Solloway, Shiffrin, and Busemeyer (2014, PNAS) showed that order effects in the responses given to pairs of agree/disagree related questions presented in succession follow a specific pattern termed QQ-equality. The fact that QQ-equality corresponds to a parameter-free prediction of a proposed quantum-probability model, together with the failure of several alternative classic-probability accounts, led Wang et al. to conclude that it constitutes strong evidence for the quantum nature of human judgments. We question Wang et al.'s conclusion by showing that the class of one of the alternative models they originally dismissed is able to yield the QQ-equality as a parameter-free prediction (or a very-likely prediction a priori) and provides an account of other aspects of the data that is comparable to their quantum model. Finally, we argue that the assumption of participant homogeneity is problematic as it can lead to spurious rejections of simpler candidate models.

Symposium: Recent developments in person perception (Part I)

Time: Monday, 27/Mar/2017: 8:40am - 10:00am · Location: 101
Session Chair(s): Corrina Maguinness, Katharina von Kriegstein

Famous face and voice recognition disorders in Semantic Dementia patients with a prevalent atrophy of the right and left temporal lobes

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Background

The study of patients with right and left temporal lobe atrophy (TLA) has shown that familiarity feelings and semantic retrieval from face are mainly impaired by right TLA, whereas face naming is mainly affected by left TLA. Some data suggest a similar impairment of voice recognition by right TLA and of voice naming by left TLA. The present investigation aimed to evaluate famous face and voice recognition disorders in SD patients with a prevalence of right and left TLA.

Methods

Subjects. The study comprised 13 SD patients (8 with predominantly right and 5 with predominantly left TLA). At the disease onset almost all patients with left TLA had presented anomia, whereas patients with right TLA had shown prosopagnosia and behavioural disorders. PET was available in 12 of these patients.

The experimental battery. Fourty-nine photos and 30 voices of famous Italian people were used to construct the experimental battery, which consisted of 2 naming (faces and voices) and 2 recognition tasks: face-name matching (F-NM) and voice- name matching (V- NM).

Results

Comparison between SD patients with right and left ATL atrophy on the person recognition tasks. Results obtained by SD patients with right-sided atrophy were systematically lower than those obtained by SD patients with left-sided atrophy and results obtained with voice stimuli were always worse than those obtained with face stimuli. The difference between patients with right- and left-sided atrophy was, however, not significant for the naming tasks

Correlation of PET results with face and voice knowledge. In ROI-based analyses a strong correlation was found between right temporal cortex and both face-to-name matching test ($r = 0.73$; $p = 0.007$) and voice-to-name matching test ($r = 0.83$; $p = 0.002$), whereas the correlation between the left temporal cortex and the two tests was not significant.

Conclusion

Our data confirm a greater representation of face and voice in the right TL and of name in the left TL

Voice-identity processing deficits are induced by lesions in the temporal and inferior parietal lobe

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Human voice recognition is an essential skill for social interactions. The mechanisms that the human brain uses for voice recognition are to-date unknown. According to studies in patients with brain lesions, voice recognition critically involves the bilateral temporal lobe and the right inferior parietal lobe. In contrast, functional magnetic resonance imaging (fMRI) studies suggest that primarily the right temporal lobe contributes to voice recognition. In order to systematically investigate brain regions required for voice recognition, we conducted a voxel-based lesion symptom mapping (VLSM) study. The study included a comprehensive behavioural test battery, neuropsychological assessment and high-resolution structural brain images. We tested 58 patients having unilateral focal brain lesions on unfamiliar and familiar voice recognition as well as face recognition skills. VLSM analysis revealed three key findings. (i) A strong association between right temporal and right inferior parietal lobe lesions and voice-recognition deficits. (ii) Only the association of the right temporal lobe with voice-recognition deficits remained significant when we controlled for face-recognition performance. (iii) Unfamiliar voice-recognition deficits were associated with lesions in the right temporal lobe as well as in the right inferior parietal lobe. The ability to recognise familiar voices was associated with left posterior temporal lobe lesions. Our results help to explain the discrepancies between previous lesion and fMRI findings. They show that both the right temporal lobe and the parietal lobe play critical roles for voice-recognition abilities. The right temporal lobe might be key for the representation of the voice and speaker identity, while the parietal lobe might be involved in a more multimodal representation of person identities.

Temporal voice areas exist in autism spectrum disorder but are dysfunctional for voice identity recognition

Stefanie Schelinski¹, Katharina von Kriegstein^{1,2}

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The ability to recognise the identity of others is a key requirement for successful communication. Brain regions that respond selectively to voices exist in humans from early infancy on. Currently it is unclear whether dysfunction of these voice-sensitive regions can explain voice identity recognition impairments. Here, we used two independent functional magnetic resonance imaging (fMRI) studies to investigate voice processing in a population that has been reported to have no voice-sensitive regions and difficulties in voice identity recognition: autism spectrum disorder (ASD). Our results refute the earlier report that individuals with ASD have no responses in voice-sensitive regions: Passive listening to vocal, compared to non-vocal, sounds elicited typical responses in voice-sensitive regions in the high-functioning ASD group and controls. In contrast, the ASD group had a dysfunction in voice-sensitive regions during voice identity but not speech recognition in the right posterior superior temporal sulcus/gyrus (STS/STG)— a region that has been previously implicated in processing acoustic voice features and unfamiliar voices. The right anterior STS/STG correlated with voice identity recognition performance in controls but not in the ASD group. The findings suggest that right STS/STG dysfunction is critical for explaining voice recognition impairments in high-functioning ASD and show that ASD is not characterised by a general lack of voice-sensitive responses. We provide evidence that voice-sensitive regions in the brain play a critical role in the recognition of vocal identity, beyond their role in discriminating voices from non-vocal sounds. Furthermore, our results suggest that it is the posterior temporal lobe voice region that integrates the acoustic characteristics of the voice into a coherent percept.

Voice distinctiveness influences unfamiliar face recognition

Isabelle Bülthoff¹, F N Newell²

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Face and voice are two preeminent physical cues describing a person. In unimodal face studies, faces are believed to be represented in a psychological multidimensional space built around a norm face. This norm-based framework is purely visual and can account for the recognition advantage of distinctive faces. Could this visual framework be extended to include voices? First, we investigated whether face distinctiveness can be of multi-modal nature. Participants saw faces paired to distinctive or typical auditory stimuli during a learning phase. Thereafter their recognition performance was tested with the learned faces presented alone among new faces. We assessed whether their recognition was affected by the distinctiveness of the auditory stimuli. Further, we asked whether the type of auditory stimuli paired to the faces (voices or other sounds) mattered. We found that recognition performance was better for faces previously paired with distinctive than with typical voices while no such distinctiveness effect was observed after face-sound pairing. These findings suggest that facial distinctiveness can be indeed of a multi-sensory nature as the memory for faces can be modified by the perceptual quality of related vocal information. Second, we investigated whether faces and voices are integrated early on to form a multisensory representation of a person in memory. We used a similar learning phase followed by a crossmodal priming paradigm to test whether a face familiarity decision could be primed by voices. We found that voice primes facilitated the recognition

of their paired faces. Our results suggest a strong early association between voices and faces in memory. Furthermore, we found no evidence of priming with paired sounds, thus confirming the special status of the face-voice pairing for person identification.

Symposium: Neuroplasticity of the motor system: Age, training and non-invasive brain stimulation

Time: Monday, 27/Mar/2017: 8:40am - 10:00am · Location: 103

Session Chair(s): Vanessa Krause, Bettina Pollok

The neural underpinnings of skilled sensorimotor performance in sports

Andreas Mierau^{1,2}, Thorben Hülsdünker², Heiko Strüder²

¹International University of Health, Exercise and Sports (LUNEX), Luxembourg; ²Institute of Movement and Neurosciences, German Sport University Cologne

Athletes can achieve extraordinary sensorimotor skills following years of extensive sports training. The development of such expert performance levels is associated with a substantial structural and functional reorganisation of the brain. This is particularly true for the sensory and the motor brain regions as well as for their interaction, because optimal motor control requires successful sensorimotor integration.

This talk aims to present recent findings on the neural substrates of highly skilled sensorimotor behavior in sports. In doing so, a special emphasis will be placed on EEG experiments in badminton; a sport where it is essential to perceive visual cues in the field of view and initiate a targeted motor response under critical time pressure. The results indicate superior visuomotor performance in badminton athletes is related to motion perception in the visual cortex and visuomotor transformation in premotor and supplementary motor cortical regions (Brodmann area 6). Earlier visual perception in athletes only in response to visual motion but not in response to contrast stimuli suggests selective adaptations in the visual system depending on the visual demands of the sport. In contrast, the athletes' faster visuomotor transformation may reflect a more general adaptation independent of the visual signal.

However, for a more comprehensive view on sports-induced neuroplasticity of the sensorimotor system, this talk will include a number of other important findings obtained from different methodological approaches. Therefore, adaptations at different neurobiological levels and time scales will be addressed, and this will be discussed against the background of the "neural efficiency hypothesis" in athletes.

Polarity-specific impact of tDCS on precise sensorimotor timing

Vanessa Krause, Bettina Pollok

Institute of Clinical Neuroscience and Medical Psychology, Heinrich-Heine-University Düsseldorf, Germany

Background

Precise timing is required for numerous everyday activities with most prominent value in professional sports and music. The neuronal underpinnings of sensorimotor timing rely on functional interaction within a cerebello-thalamo-cortical network. Drummers show superior synchronization with respect to a regular auditory pacing signal. This behavioural advantage is accompanied by stronger interaction between the posterior parietal cortex

(PPC) and the thalamus suggesting that precise timing is particularly mediated by the PPC.

Methods

In order to elucidate its causal involvement we transiently modulated left PPC excitability by non-invasive anodal and cathodal transcranial direct current stimulation (tDCS). We focused on behavioural after-effects of tDCS and the underlying neuronal mechanisms. Sensorimotor timing was assessed by a synchronization task requiring right-handed participants to synchronize their finger taps with a regular auditory pacing signal. A simple reaction time task served as control condition.

Results

The behavioural data suggest that polarity-specific tDCS to the PPC promotes neuroplastic alterations within the motor system via an impairment of synchronization by anodal tDCS and an improvement by cathodal tDCS. To further characterize the neuronal underpinnings of behavioural changes, the combination of tDCS with electroencephalography (EEG) provides detailed insights into tDCS-induced neuroplastic effects. Recent behavioural and EEG data from thirteen participants suggest that impaired synchronization performance following anodal PPC tDCS might be associated with altered neuronal activity within the motor system.

Conclusion

To this end, the presented set of experiments links the PPC to precise timing possibly by its relevance for matching between anticipated and real sensorimotor feedback.

Motor sequence learning and its neural dynamics: Insights from healthy aging and Parkinson's disease

Sarah Nadine Meissner¹, Vanessa Krause¹, Martin Südmeyer^{1,2}, Christian Hartmann¹, Bettina Pollok¹

¹Heinrich-Heine-University Düsseldorf, Germany; ²Ernst von Bergmann Hospital Potsdam, Germany

Background: Implicit motor sequence learning refers to the ability to incidentally acquire knowledge of sequences of events and actions and is suggested to change across the adult life span. At the neural level, the modulation of motor-cortical oscillatory activity in the alpha and beta frequency band is assumed to play a crucial role in this type of learning in young healthy adults. More specifically, the ability to suppress beta oscillations seems to facilitate learning and may be involved in the stabilization of movement patterns. In Parkinson's disease (PD) there is strong evidence that oscillatory activity within corticobasal ganglia circuits including motor cortical areas is altered. Increased beta synchronization has received particular attention as it is associated with PD motor symptoms such as bradykinesia. The present study investigates motor sequence learning in PD patients and age-matched healthy controls (HC) to determine the significance of motor-cortical beta oscillations for motor sequence learning.

Methods: 20 PD patients and 20 age-matched HC were trained on a serial reaction time task. To assess motor sequence learning, reaction times were determined during learning as well as after presentation of interfering randomly varying trials. Neuromagnetic activity was recorded throughout the task using a 306-channel whole-head magnetoencephalography system. We analyzed the data regarding oscillatory activity with particular focus on beta power. We further examined whether oscillatory power and its dynamic modulation are related to the acquisition and stabilization of motor sequences.

Results: Preliminary results suggest better learning as well as stronger modulation of beta power in healthy adults as compared to PD patients.

Conclusions: The data are in line with the hypothesis that the modulation of beta oscillations is crucial for motor sequence learning.

Motivation in action: Increasing self-directed training in stroke patients

Bettina Studer^{1,2}

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Brain injury through stroke or other causes often leads to impairments in physical and cognitive functions. These impairments can be significantly reduced by high-intensive neurorehabilitation: The more training and repetitions patients conduct, the larger and faster is their functional recovery. One strategy to maximise training intensity during neurorehabilitation is to complement therapist-directed training with “self-directed” or “patient-led” training. A major challenge of this resource-friendly approach is that self-directed training demands high levels of motivation, drive, effort and persistence, which in turn are frequently diminished following stroke. Indeed, patients’ adherence to self-directed training schedules is observed to be low in clinical practice. Novel approaches to enhance motivation, training intensity and training frequency in rehabilitation settings are thus warranted.

In this talk, I will explore potential motivation enhancement strategies and present our recent proof-of-concept study in 93 stroke patients undergoing neurorehabilitation, which demonstrated that adding an element of competition to the exercise programme is one viable and efficient approach to increase self-directed training (Studer, Van Dijk, Handermann & Knecht, 2016, Progress in Brain Research).

Symposium: Evaluative conditioning I: Processes of preference acquisition (Part I)

Time: Monday, 27/Mar/2017: 8:40am - 10:00am · *Location:* 105
Session Chair(s): Frederik Aust, Tobias Heycke, Christoph Stahl

Does CS liking without explicit US memory depend on US evocativeness in MPT studies?

Olivier Corneille¹, Adrien Mierop¹, Christoph Stahl², Mandy Hütter³

¹Catholic University of Louvain, Belgium; ²University of Cologne, Germany; ³University of Tübingen, Germany

Multiple Process Tree (MPT) studies suggest the possibility of CS liking without explicit US memory. Presumably, this “implicit” evaluative conditioning effect results from the implicit misattribution (IM) of the US valence to the CS. IM processes are assumed to be more likely to operate when US evocativeness is low than high. Therefore, MPT studies should reveal a higher A parameter (i.e., CS conditioning without CS-US pairing memory) for US of low than high evocativeness. The latter prediction was examined in two MPT studies where US evocativeness was manipulated. In Study 1, explicit memory for CS-US pairings was higher for US of high than low evocativeness. More important, a significant A parameter was observed independently of US evocativeness. Hence, contrary to the IM account, CS conditioning without CS-US pairing memory was equally likely to emerge for US of high and low evocativeness. Study 2 was designed to examine the replicability of

this effect, this time switching to a within-Ps manipulation of evocativeness and further reducing the evocativeness of the low-evocativeness US.

Evaluative Conditioning is Sensitive to Memory Reactivation of the US

Anne Gast, Borys Ruszpel

University of Cologne, Germany

Evaluative conditioning is a change in the valence of a stimulus (CS) that is due to previous pairings, typically with positive or negative stimuli (USs). We tested whether the new CS valence that is acquired over a range of pairing trials is mentally represented as an overall summary valence or in a number of learning episodes that can still be accessed separately. To investigate this, CSs were paired both with positive and with negative USs during the conditioning phase. In the measurement phase, one positive and one negative stimulus was presented along with each measured CS. In order to specifically trigger retrieval of the learning episodes that included one of the USs, one of these valent stimuli was identical to one of the USs that was paired with the CS in the conditioning phase. As predicted, CS valence was in line with the US that was shown both in the conditioning and in the measurement trials. This result suggests that the valence of a stimulus that results from pairings with a range of valent stimuli is represented in individually accessible episodes.

Distributed practice can boost evaluative conditioning by increasing memory for the stimulus pairs

Jasmin Richter, Anne Gast

University of Cologne, Germany

Background: When presenting a neutral stimulus (CS) in close temporal and spatial proximity to a positive or negative stimulus (US) the former is often observed to adopt the valence of the latter, a phenomenon named evaluative conditioning (EC). It is already well established that under most conditions, contingency awareness is important for an EC effect to occur. In addition to that, some findings suggest that EC effects are strongly related to memory for the pairings that is still available during the measurement phase. Previous research has shown that memory is better after temporally distributed (spaced) than after contiguous (massed) repetitions. The current studies test whether also EC effects are moderated by distributed practice manipulations.

Methods: In two online studies we manipulated the temporal distribution of the pairings in the conditioning phase within-participants and between-participants. Afterwards, memory for pairings and evaluation of CSs were assessed.

Results: With successful distributed practice manipulations on memory, we show that also the magnitude of the EC effect was larger for pairs learned under spaced compared to massed conditions. Both effects, on memory and on EC, are found after a within-participant and after a between-participant manipulation. However, we did not find significant differences in the EC effect for different conditions of spaced practice.

Conclusion: These findings are in line with the assumption that EC is based on similar processes as memory for the pairings.

Reversed dissociation between CS evaluation and US expectancy through explicit reference to learning contexts

Frederik Aust¹, Julia Haaf², Christoph Stahl¹

¹University of Cologne, Germany; ²University of Missouri

Evaluative conditioning (EC) is a change in liking of neutral stimuli (conditioned stimulus, CS) following pairings with positive or negative stimuli (unconditioned stimulus, US). Theories of EC differ in the number of underlying processes they postulate. Single-process theorists argue that one learning process suffices to explain EC related findings. Advocates of dual-process theories argue for a second learning process, e.g., because participants' US expectancy is decreased by repeated encounters of CS without US (extinction) but CS evaluation is not affected. Dual-process theories invoke an automatic associative learning process that underlies CS liking in addition to a deliberative propositional learning process that underlies US expectancy. In two experiments, we tested a competing single-process explanation of the evaluation-expectancy dissociation. We found evidence supporting the proposition that ratings of liking and expectancy are based on a single representation of past experiences but that these representations are used differently depending on the rating task. Expectancy ratings, assumedly due to their predictive nature, reflect recent events while liking ratings reflect information integrated across a wider range of past experiences. In line with this account, we were able to reverse the evaluation-expectancy dissociation by instructing participants to base liking ratings on recent experiences and expectancy ratings on a wider range of past experiences.

Symposium: Eye tracking as a window to cognition (Part I)

Time: Monday, 27/Mar/2017: 8:40am - 10:00am · Location: HS 304

Session Chair(s): Christina Pfeuffer, Stefanie Aufschneider

Test-retest reliabilities of attention capture effects measured by manual responses and eye movements

Hanna Weichselbaum, Christoph Huber-Huber, Ulrich Ansorge

University of Vienna, Austria

We analyzed the temporal stability or test-retest reliability of bottom-up and top-down attention capture effects as well as intertrial priming of attention by using a visual search paradigm. Participants searched for a target having one specific color in most of the trials and reported a stimulus inside the target. In some trials, distractors were presented. Top-down matching distractors had the same color as the searched-for target; non-matching distractors had a different color than the target. In addition, we used trials with a color-singleton target including no distractor. Bottom-up capture was reflected in a difference between trials with a non-matching distractor and trials without a distractor. Top-down capture was reflected in a difference between trials with a matching distractor and trials with a non-matching distractor. Top-down matching distractors were either primed or unprimed by the target of the preceding trial. We analyzed bottom-up, top-down, and priming of attention capture with manual response times and target fixation latencies of non-instructed eye movements on two different points in time, separated by several days. Correlations based on linear mixed models revealed that bottom-up and top-down attention capture effects showed high temporal stability at individual and group levels when including intertrial priming effects.

The influence of change size on transsaccadic shape prediction

Cassandra Philine Köller, Arvid Herwig

Bielefeld University, Germany

Due to the inhomogeneity of our visual system only foveated objects are processed with a high spatial resolution, whereas objects in the peripheral visual field are only coarsely represented. Nevertheless, we succeed in guiding our eye movements task-dependently to peripheral objects which probably requires a first guess about their identity. It was recently suggested that peripheral object recognition uses transsaccadic predictions made on the basis of previously established transsaccadic associations (Herwig, & Schneider, 2014, JEPG). Until now, only little is known about the conditions and mechanisms influencing the acquisition and application of transsaccadic associations. Here, we investigated the influence of change size during the acquisition of transsaccadic associations on transsaccadic shape predictions. First, unfamiliar transsaccadic associations were established by systematically changing the shape of one object during the saccade (either from more circular to more squarish or vice versa), varying the change size between participants. As control condition, a second object was not changed. Subsequently, testing peripheral shape recognition revealed a learning effect indicated by a judgement shift toward previously associated foveal input. Importantly, this learning effect depended on the change size during the acquisition of transsaccadic associations. Supporting previous research, these results provide evidence for the assumption that on the basis of past experience the visual system makes predictions of the perceptual consequences of saccades. The present findings reveal change size as an important factor influencing transsaccadic predictions and thus, offer a more detailed prospect of learning mechanisms underlying the acquisition and application of transsaccadic associations.

Pupil Size Changes Indicate Intended Targets in Multiobject Selections

Christoph Strauch, Jan Ehlers, Anke Huckauf

Ulm University

Human computer interaction could be supported by changes in activity indicated by peripheral physiological variables. Still, only few physiological-computing applications exist that can be supposed to be usable. Besides long latencies, also the low specificity of signal changes hinders the development of usable applications. One exception might be pupil sizes: their temporal resolution is high and pupil size changes may be attributable to specific cognitive processes such as decision making. Given that object selections produce comparable signal changes, this may provide a new way interaction concept computers. In a task with circularly arranged objects, objects could be selected by a simple mechanism relying on the change in pupil size. Signal dynamics were collected for each correct object selection. The tracked signal dynamics reveal that intended objects are indeed accompanied by specific pupil size changes which can be observed already within the first half second.

A Look into the Future: Spontaneous anticipatory saccades reflect processes of anticipatory action control

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According to ideomotor theory, human action control employs anticipations of one's own actions' future consequences, that is, action effect anticipations, as a means of triggering actions that will produce desired outcomes (e.g., Hommel, Müsseler, Aschersleben, & Prinz, 2001). Using the response-effect compatibility paradigm (Kunde, 2001), we demonstrate that the anticipation of one's own manual actions' future consequences not only triggers appropriate (i.e., instructed) actions, but simultaneously induces spontaneous (uninstructed) anticipatory saccades to the location of future action consequences. In contrast to behavioral response-effect compatibility effects which have been linked to processes of action selection and action planning, our results suggest that these anticipatory saccades serve the function of outcome evaluation, that is, the comparison of expected/intended and observed action outcomes. Overall, our results demonstrate the informational value of additionally analyzing uninstructed behavioral components complementary to instructed responses and allow us to specify essential mechanisms of the complex interplay between the manual and oculomotor control system in goal-directed action control.

Talk Session: Working memory I

Time: Monday, 27/Mar/2017: 8:40am - 10:00am · Location: 201

Session Chair(s): Markus Conci

The effect of refreshing and elaboration on working memory performance and their contribution to long-term memory formation

Lea Maria Bartsch, Klaus Oberauer

University of Zurich, Switzerland

The maintenance of information in working memory (WM) is assumed to rely on processes such as attentional refreshing – defined as briefly thinking of an item just after the stimulus is no longer physically present but while a representation is still active (Johnson, 1992) – or elaboration of the to-be-remembered material. The benefits of enriching the memory representation of an item by activating associated representations in long-term memory (LTM) are well documented (e.g. Craik & Tulving, 1975) and refreshing hints to also improve LTM (Johnson et al., 2002). We are interested in the extent to which elaboration and refreshing are distinct in WM in terms of their contribution to WM and LTM retrieval. For that purpose we conducted an experiment in which immediate memory performance of a list of six sequentially presented words is compared under four different maintenance processing conditions: After initial encoding of all of the memory items, either the first or the last three words of a study list were shown again, refreshed, elaborated or refreshed and elaborated simultaneously. Our results show no effect of elaboration on WM compared to a read condition and a decline in immediate memory for refreshed items. LTM retrieval was highest for elaborated items, proving a successful manipulation of maintenance processes at encoding in our paradigm. Refreshing had no significant effect on LTM performance. These findings are discussed in light of current theories of working memory that assume that maintenance depends on activation through attentional focussing and lead to question the immediate effect of elaboration on memory.

Can mind wandering account for time-related forgetting in working memory?

Alexander Soemer

University of Potsdam, Germany

Background

Interference between memory representations is traditionally considered as one of the main explanations for forgetting in working memory. Because pure interference accounts predict that no forgetting should occur without interference, they have difficulties explaining data showing that memory performance declines over time in unfilled retention intervals (RI). One way to explain such time-related forgetting from an interference viewpoint is to assume that participants 'mind wander' during unfilled RIs and thereby create interference internally.

Method

To test this hypothesis, an experiment was conducted that combined a probe recognition paradigm with the experience sampling approach dominantly used in mind wandering research. Participants retained three sounds over unfilled RIs of either 6 or 12 seconds and then judged whether or not a subsequently presented probe sound matched one of the remembered sounds. At the end of some trials, participants were asked to report whether or not they had mind wandered during the RI.

Results

The results of this experiment showed that probe recognition performance was lower in 12s-RI compared to 6s-RI trials replicating previous experiments. Furthermore, more mind wandering reports followed 12s-RI trials compared to 6s-RI trials. However, contrary to the predictions of the mind wandering hypothesis, there was no evidence that recognition performance in mind wandering trials was worse compared to 'on-task' trials, nor was there evidence for the prediction that time-related forgetting was limited to mind wandering trials.

Conclusions

Overall, the results suggest that although more mind wandering occurs during longer RIs, this mind wandering does not seem to be associated with time-related forgetting. This finding is unexpected from the viewpoint of pure interference accounts and, instead, suggests that something other than interference accounts for time-related forgetting in unfilled RIs.

Non-Converging Evidence for a Single-Item Focus of Attention in Working Memory

Marcel Niklaus, Klaus Oberauer

University of Zurich, Switzerland

The focus of attention privileges a representation in working memory. This privilege is thought to result in greater accessibility of the most recently presented item in a Sternberg recognition task (recency benefit) as well as improved recognition performance when an item held in memory is retro-cued for an upcoming recognition task during the retention interval (retro-cue benefit). If both empirical phenomena result from the same mechanism of the focus of attention, the retro-cue benefit should be diminished for the most recently presented item. We report two experiments that merged the two procedures in order to test this hypothesis. We applied the response-signal speed-accuracy trade-off procedure to recognition tasks in which items were presented serially and in some trials a memory

item was retro-cued during the retention interval. Participants were cued to immediately respond to a response signal which was presented at various times (deadlines) after probe onset. With increasing deadlines, participants move from a period of chance performance to a period of increasing accuracy before reaching an asymptotic level. Using Bayesian hierarchical modeling, we fitted the data with an exponential approach to a limit in order to measure three parameters that capture these periods: 1) an intercept that indicates the point of time when accuracy departs from chance, 2) the rate at which accuracy approaches the asymptote, and 3) the level of asymptotic accuracy. For non-cued trials, we found a benefit for the most recently presented item on the intercept. Moreover, all serial positions showed a retro-cue benefit on the intercept. Importantly, this benefit was not diminished for the most recently presented item, despite the fact that this item should be in the focus of attention already. These findings suggest that recency and retro-cue effects are not solely driven by the same mechanism of the focus of attention.

Storage of hierarchical objects in visual working memory

Markus Conci, Hermann J. Müller, Qi-Yang Nie

Ludwig-Maximilians-Universität München, Germany

When remembering a natural scene, both detailed information about specific objects and summary representations such as the gist of a scene are encoded. However, formal models of change detection that are used to estimate working memory capacity, typically assume observers simply encode and maintain memory representations that are treated independently from one another without considering the (hierarchical) object or scene structure. To overcome this limitation, we present a hierarchical variant of the change detection task that attempts to formalize the role of object structure, thus, allowing for richer, more graded memory representations. We demonstrate that detection of a global-object change precedes local-object changes of hierarchical shapes to a large extent. Moreover, when systematically varying object repetitions between individual items at a global or a local level, memory performance declines mainly for repeated global objects, but not for repeated local objects, which suggests that ensemble (i.e., summary) representations are likewise biased towards a global level. In addition, this global memory precedence effect is shown to be independent from encoding durations, and is mostly not due to differences in saliency or shape discriminability at global/local object levels. Overall, this pattern of results is suggestive of a global/local difference occurring primarily during memory maintenance. Together, these findings challenge visual-working-memory models that propose that a fixed number of objects can be remembered regardless of the individual object structure. Instead, our results support a hierarchical model that emphasizes the role for structured representations among objects in working memory.

Talk Session: Selective attention: Social and emotional factors

Time: Monday, 27/Mar/2017: 8:40am - 10:00am · Location: 204
Session Chair(s): Juergen Goller

The influence of relationship status and sociosexual orientation on the visual exploration of facial attractiveness

Aleksandra Mitrovic¹, Juergen Goller¹, Pablo Tinio², Helmut Leder¹

¹University of Vienna, Faculty of Psychology, Austria; ²Montclair State University, Department of Educational Foundations, USA

Facial attractiveness influences our everyday interactions in that it catches and binds attention and therefore modulates our visual exploration. In this study, we tested how the perceivers' relationship status and sociosexual orientation affect processing of facial attractiveness. We expected that (1) more attractive faces would in general receive more attention (operationalized as longer fixation duration and higher number of fixations) as compared to less attractive faces, (2) this behavioral effect would be stronger for participants who are looking for a partnership as compared to participants who already are committed to a romantic partnership, (3) and for participants who score high on the "Sociosexual Orientation Inventory". As stimuli we used pictures of urban real world scenes depicting two people who differed in facial attractiveness (ranging from subtle to pronounced). While participants looked at these pictures, we recorded their eye movements. In a following block, participants rated the attractiveness of all presented faces. We used the ratings as an explicit measure of attractiveness and linked them to the eye movement patterns which served as implicit measure. We found that attractive faces were generally looked at longer than less attractive faces. Additionally, perceiver variables had modulating effects on the attention towards attractive faces. We conclude that the importance of attractiveness is modulated by perceivers' motives and goals.

Gaze Behavior and Liking in Faces and Artworks

Juergen Goller¹, Aleksandra Mitrovic¹, Vanessa Mitschke², Helmut Leder¹

¹University of Vienna, Austria; ²University of Würzburg

In a series of eye-tracking studies we examined how individual liking influences gaze behavior in a free-viewing paradigm. We presented two faces or artworks simultaneously and recorded various eye-tracking parameters, which we then linked to measures of liking. We found a strong and stable relation between liking and gaze behavior in that higher liking increased visual attention. This relation appeared for artworks, street art, and for female and male faces regardless of the sex of the perceiver. We discuss our results in regards to evolutionary and motivational aspects along the dimension of approach and avoidance. We also address the question whether liking is driving gaze behavior unidirectional or if gaze behavior also affects liking. Our findings are a further step to a generalized theory of valence affecting visual attention in real life vision.

On his or my left side? Studying spatial coding with multiple reference frames in a Simon task

Pamela Baess, Christina Bermeitinger

University of Hildesheim, Germany

Previous studies have shown that multiple spatial codes can be formed in a Simon Task. However, these Simon effects due to multiple reference frames were only present when an external object was given next to the target. In a series of three experiments, we applied a version of a Simon Task using ecologically significant stimuli, namely stick-figure manikins. The manikins were presented on the either side of the screen (egocentric reference frame). Moreover, the manikins were holding a ball in either hand (allocentric reference frame). In contrast to previous research, both reference frames were present at the same time and most importantly, did not require an external reference point. Further, the amount of manikins on the display was varied; presenting the manikin either alone (1-manikin condition) or within a set of nine identical manikins (9-manikin condition). Spatial codes were formed on both, egocentric and allocentric reference frame, but the size of the Simon effect varied: larger Simon effects were obtained for the spatial codes based on the egocentric perspective in the 1-manikin condition compared to the 9-manikin condition. No such effect was observed for the spatial codes based on the allocentric reference frame. These results offer new perspectives for linking social and spatial cognition.

Symposium: Experimentelle Ästhetik / Experimental Aesthetics (Part I)

Time: Monday, 27/Mar/2017: 8:40am - 10:00am · Location: HS 403

Session Chair(s): Thomas Jacobsen

Disentangling Beauty and Attractiveness - Portrait Paintings from an Empirical Aesthetics Perspective

Gregor Uwe Hayn-Leichsenring, Jana Katharina Schulz, Christoph Redies

FSU Jena, Germany

For centuries, portraits have been one of the most prominent subjects of art paintings. An interesting aspect of portrait paintings is the simultaneous display of two different kinds of hedonic qualities. These are (a) the artistic beauty of the image, which relates to image composition and painting style, and (b) the attractiveness of the depicted person. We argue that perception of attractiveness is driven by basic bottom-up processing to a large extent, while the perception of artistic beauty is, at least partly, based on cognitive processing. To test this hypothesis, we conducted several behavioral experiments. In a gist study (Experiment 1), we found that ratings on artistic beauty were higher after long-term presentation (3000ms) than after ultra-rapid presentation (50ms), while the opposite pattern was the case for attractiveness. In an adaptation study (Experiment 2), we showed that the perceptual contrast effect was weaker for artistic beauty than for attractiveness. These results suggest that evaluating artistic beauty is modulated partially by cognition, while processing of attractiveness is predominantly driven perceptually. The dichotomy between cognitive and perceptual processing of different kinds of beauty suggests that they are mediated by different neuronal mechanisms.

Pictorial balance and aesthetic preference: Their relation depends on the image type

Martin G. Fillinger, Ronald Hübner

University of Konstanz, Germany

Pictorial balance is known as a fundamental structural feature of pictorial compositions. Balance influences aesthetic appreciation substantially, which is also acknowledged in art theory. Hence, for empirical aesthetics it is important to investigate perceptual balance to understand its underlying mental mechanisms. Previous research with simple stimulus material has confirmed the strong relation between aesthetic preference (liking) and balance ratings. Until now, however, it is not clear whether this strong relation also holds for more complex pictorial compositions. To answer this question, two experiments with more complex pictures were conducted, in which participants had to judge the stimuli with respect to liking and balance. In the first experiment, Japanese calligraphy served as stimulus material. The results show no significant connection between liking and balance ratings on a picture-level. Moreover, different objective measures of balance failed as predictors of the balance ratings. In the second experiment art pictures from the Visual Aesthetic Sensitivity Test (VAST) had to be rated. Also for these stimuli we did not find significant relations between balance, liking, and objective measures of balance. However, we identified three different image types and analysed them separately. The analysis revealed that the largest correlation occurred for images including elements whose arrangement can be interpreted as balanced in the sense of physical stability. Our findings show that the often proposed link between pictorial balance and aesthetic preference does not hold generally. Rather, pictorial balance is a concept with different meanings, depending on the image content or context. It seems that participants apply different concepts of balance, of which only some relate to liking.

Individual Differences in Aesthetic Judgments of Symmetry

Andreas Gartus, Helene Plasser, Helmut Leder

University of Vienna, Austria

It is well known that for novel abstract graphic patterns, symmetry is an important predictor of aesthetic judgments (e.g., Eisenman, 1967). However, it is also known that, while this is true on average, there exist substantial individual differences (Jacobsen & Höfel, 2002). We investigated general and individual preference for symmetry in two experiments: In an online study, 80 participants rated 250 abstract black-and-white patterns differing in symmetry and complexity (similar to the stimuli used in Gartus & Leder, 2013) for liking. In addition, participants completed the 16-NCCS questionnaire of Schlink and Walther (2007) measuring individual need for cognitive closure (NCC). NCC is conceptualized as desire for definite knowledge and rejection of ambiguity. It is assumed to vary between individuals and situations (Webster & Kruglanski, 1997). The second experiment was conducted in the lab and 108 participants rated the same stimuli and filled out the same questionnaires as in the first experiment.

For each stimulus pattern, a continuous measure of mirror symmetry was calculated (Hübner & Fillinger, 2016). In both experiments, we found a significant interaction between individual NCC and mirror symmetry scores of the stimuli: While on average, participants preferred symmetric over less symmetric stimuli, the higher the NCC score was, the higher was also the preference for symmetry. This is in line with theory, since a high NCC is also associated with increased preference for order and structure.

A relation between NCC and preference for figurative and realistic over abstract and nonrealistic paintings has been shown recently (Chirumbolo et al., 2014; Ostrofsky & Shobe, 2015; Wiersema et al., 2012). Here, we found additional evidence that NCC is also positively related to preference for symmetry. Therefore, the results of our research further support the relevance of need for cognitive closure for predicting individual differences in aesthetic preferences.

Entropy of Edge Orientations in Traditional Art, Abstract Art and “Bad Art”

Christoph Redies, Anselm Brachmann

Jena University Hospital, Friedrich Schiller University Jena, Germany

In a previous study (Redies, Brachmann and Wagemans, manuscript submitted), we asked whether “good composition” or “visual rightness” in artworks manifest themselves in a particular arrangement of edge orientations. To this aim, we studied large sets of traditional artworks from different cultural backgrounds (Western, Islamic and East Asian). For each image, we measured the relative orientations of edge pairs across the image. Results for artworks were compared to results for other types of images (photographs of man-made objects and natural scenes). For traditional artworks, we showed that the orientation of a given edge in an image does not correlate with the orientations of other edges in the same image, except for nearby edge pairs, which tend to be collinear. In other words, the entropy of edge orientations is high in traditional artworks. Moreover, complexity (i.e., edge density) assumes intermediate values in traditional artworks. Here, we extended our analysis to abstract artworks and to artworks from the Museum of Bad Art, Needham, MA, USA, which collects artworks that are considered to be of lesser importance. The entropy of edge orientations in these two sets of artworks is lower on average than those of the traditional artworks, although there is a considerable degree of overlap. Also, complexity varies more widely than in traditional artworks. These results suggest that, on the one hand, traditional artworks from different cultural backgrounds represent a subset of artworks that is rather distinct with respect to the measured properties. On the other hand, images of modern artworks and “bad art” show a much larger variability. In conclusion, we obtain evidence for similarities for traditional artworks across cultures. At the same time, our results underscore the special characteristics of some (post-)modern art genres, as exemplified by abstract artworks.

Talk Session. Decision making under risk and uncertainty

Time: Monday, 27/Mar/2017: 8:40am - 10:00am · Location: HS 405

Session Chair(s): Stefan Ehrlich

Safe is easy! The role of option complexity in measuring age differences in risk attitudes

Veronika Zilker, Thorsten Pachur

Max Planck Institute for Human Development, Germany

Previous studies comparing risk attitudes in younger and older adults have often found that older adults have a lower tendency to choose a risky gain than younger adults, and have interpreted this as reflecting age differences in risk attitude. Many of these studies, however, relied on tasks that involved a choice between a safe and a risky option. We argue that using such items confounds the riskiness of the options and their complexity: evaluating safe options that are defined by a single, easily understandable outcome

requires less elaborate mental operations than evaluating risky options, that consist of several probabilistic outcomes. Due to their impaired fluid cognitive capacities, in particular older adults may gravitate towards more easily comprehensible safe options. In a set of studies we tested this hypothesized influence of task complexity on risky choice and attempted to obtain a measure of age differences in risk propensity that is less contaminated by age-related differences in responses to task complexity.

Toward that end, we created a set of lottery problems that disentangle risk and complexity and presented it to a sample of 80 younger (age 18-35) and 80 older (age 55-71) adults.

The results show that, as predicted, safe gains become less attractive when they are presented in a more complex format, apparently decreasing risk aversion. This effect emerged for both younger and older adults, but it was more pronounced for older adults. Furthermore, on choices between two equally complex risky gains—a measure not confounded by complexity—younger and older adults showed similar levels of risk aversion.

These results suggest that the frequently reported result of increased risk aversion in older adults may be largely due to the experimental stimuli used in the previous literature. Taking into account age-related differences in the preference for complex vs. simple stimuli, age difference in genuine risk attitudes disappear or even reverse.

Making people reflect on options interferes with decision making under risk

Silke M. Müller¹, Johannes Schiebener¹, Matthias Brand^{1,2}

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Considering possible consequences related to different options is a key process when making decisions. Studies showed that reflective processes like deliberating about options, using executive functions, and applying calculative strategies favour advantageous decision making under risk (e.g. Schiebener & Brand, 2015; Buelow, 2015). We hypothesized that triggering reflective processes by asking participants to answer questions about task contingencies and to rate choice options during a complex decision-making task may lead to superior decision-making performance.

In an experimental study we invited 109 participants to do a complex decision-making task under objective risk conditions (i.e. the Cards and Lottery Task; Mueller et al., 2016) that requires consideration of opposing short- and long-term consequences. One group (n=54) repeatedly received interposed questions assessing consciously accessible knowledge about the task's contingencies, while the other group performed the task in the standard version.

On average, participants performed equally well in both groups. However, in contrast to the group answering questions during the task, good performance in the standard version was associated with executive functions. It also correlated positively with the use of a calculative strategy and negatively with intuitive decision making. Interestingly, the results show that individuals who reported to use a mathematical strategy performed significantly weaker in the group where reflection should be stimulated than participants in the standard version.

Thus, explicitly asking to reflect about different decision-options may lead intuitive deciders to more advantageous choices, but it can interfere with calculative strategies and even lead some persons to overall less advantageous decisions. Our findings underline the

assumptions of decision-making models which suggest external input and cognitive functions to interactively determine the quality of decision making.

Risk is reward: Exploiting the environment's risk-reward structures in decisions under uncertainty

Christina Leuker, Timothy J. Pleskac, Thorsten Pachur, Ralph Hertwig

Max Planck Institute for Human Development, Germany

In many domains in the environment, the higher payoffs that people desire are unlikely to occur (Pleskac & Hertwig, 2014). This negative risk-reward relationship seems natural for people to exploit to infer missing probabilities for uncertain prospects. How do people (1) adapt to different risk-reward environments and (2) subsequently use these risk-reward relationships in decisions under uncertainty? To test this, we exposed participants to different risk-reward environments using monetary gambles of the form “p chance of winning x, otherwise nothing” across three laboratory studies (N = 350). In a between-subjects design, we manipulated the gambles’ payoffs and probabilities such that they were (1) negatively correlated, (2) positively correlated or (3) uncorrelated.

In a subsequent test phase, we studied how exposure to the different environments influences decisions under uncertainty. For instance, when choosing between a sure outcome (i.e., probability 100%) and a gamble with a twice-as-large payoff, but unknown probability, participants who had been exposed to a negative risk-reward relationship were less likely to pick the gamble when the gamble’s payoff was high. These results are consistent with data from an explicit estimation task, in which participants in this condition estimated low probabilities for high payoffs and vice versa. This pattern was reversed, but less pronounced, for participants who had been exposed to a positive risk-reward relationship. In the uncorrelated condition, participants’ choices and probability estimates did not depend on the payoff magnitudes. Overall, these results suggest that people are sensitive to different risk-reward ecologies and exploit the relationship that is present in the particular environment.

Modelling Risky Choice and Personality

Andreas Glöckner^{1,33}, Thorsten Pachur²

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In previous work we have shown that risky choice behavior in simple tasks can be best predicted by Cumulative Prospect Theory including parameters for risk aversion, loss aversion, and probability weighting. Elaborating on this work, we simultaneously model the influence of HEXACO personality, numeracy, cognitive reflection and (in one of the studies also) intelligence on all of these parameters. The analysis is run on the data from three studies, with a total sample size of more than one-thousand. Results indicate reproducible relations between parameters for modelling risky choice and personality.

Talk Session: Visual perception

Time: Monday, 27/Mar/2017: 8:40am - 10:00am · Location: HS 301
Session Chair(s): Matteo Toscani

Illusory Peripheral Vision

Matteo Toscani, Matteo Valsecchi, Karl Gegenfurtner

University of Giessen, Germany

Despite poor resolution and distortions in peripheral viewing, the visual scene appears uniform. We hypothesize that, peripheral appearance is extrapolated based on foveal information. In the present study we aim to test this hypothesis in the particular case of brightness perception: specifically, we investigate whether the brightness of shaded objects at peripherally viewed locations is influenced by the foveal content. We rendered a matte cylinder in a gray room in order to test whether perception of peripherally viewed local brightness (i.e. most of the perceived luminance distribution) of the virtual surface is affected by the fixated luminance. Naïve observers were forced to look at a certain dark (DF) or light (LF) region of the surface. A gaze-contingent display forced the observers to fixate the chosen locations, i.e. they could see the scene image only when fixating the selected fixation spot. Observers were asked to adjust a uniform circle on the right side of the computer screen to have the same luminance as the area of the cylinder surface indicated by a small (.5° radius) red open circle. Fixation of the light points lead to brighter matches compared to fixating the dark points. We also tested whether the influence of the foveal content on the peripherally perceived brightness is occurring independently on the content of the scene or it is selectively applied within an object's boundary, where extrapolation is reasonable. To do so, observers fixated other two fixation points matched in luminance with the previous dark or light region, but presented on the background of the virtual room instead of being part of the cylinder surface. In this latter case the fixation condition did not affect brightness matches. Results indicate that our visual system uses the brightness of the foveally viewed surface area to estimate the brightness of areas in the periphery, and that this mechanism is selectively applied within an object's boundary. The difference between foveal and peripheral sampling is a fundamental aspect of the architecture of the visual system. Hence we speculate that the extrapolation mechanism that we demonstrated for brightness perception is a general principle of vision, and further investigations should test to what extent it applies to other domains of visual perception.

Surface lightness affects the perceived layout of interior space

Christoph von Castell, Heiko Hecht, Daniel Oberfeld

Johannes Gutenberg-Universität Mainz, Germany

With regard to small objects, previous studies have reported that the lightness contrast between an object and its background modulates the object's perceived distance: lower lightness contrasts led to larger perceived distances than higher contrasts. With regard to interior space, in contrast, previous studies have reported that a room's perceived height is influenced by the lightness of the ceiling, but not by the lightness contrast between ceiling and walls: brighter ceilings appeared higher than darker ceilings, irrespective of wall lightness or floor lightness. However, these studies focused mainly on perceived height and used solely achromatic colors. Here, we report two experiments in which we extend the previous findings to effects of surface lightness on perceived depth and width (Experiment 1) and to effects of chromatic ceiling colors (Experiment 2). In both experiments, we presented stereoscopic room simulations on an Oculus Rift DK2. In

Experiment 1, we varied the lightness of the rear wall, side walls, and ceiling. We found that rooms with a lighter rear wall appeared deeper than rooms with a darker rear wall, and that rooms with lighter side walls appeared wider than rooms with darker side walls. In Experiment 2, we varied the hue (red, green, blue), saturation (low, high), and lightness (light, dark) of the ceiling. We found the previously reported ceiling lightness effect to apply also to chromatic colors: subjects judged lighter ceilings to be higher than darker ceilings, irrespective of hue and saturation. The remaining color dimensions had only a very small effect (hue) or virtually no effect (saturation) on perceived height. In sum, our results confirm that the perceived extent of a given spatial dimension is affected by the lightness of the room's bounding surfaces (e.g., the side walls for perceived width), but is less affected by hue and saturation or by the lightness contrast between the bounding surfaces and the other surfaces.

The link between individual differences in colour perception and the dress

Christoph Witzel

Justus-Liebig-Universität Gießen, Germany

The photo of the colour-switching dress (known as #theDress) revealed striking individual differences in colour perception. Are these individual differences an idiosyncratic phenomenon, or are they due to more general differences in colour perception? This study compares results from an experiment on the dress with results from an experiment on colour constancy. Colour constancy is the recognition of colours across illumination changes. On the one hand, the experiment on the dress showed that the perceived colours of the dress are related to the observers' assumptions about the illumination, and in particular to whether observers thought the dress is in the shadow or in direct light. It also showed that the perception of the dress can be changed by manipulating the observers' prior assumptions about the illumination of the scene in the photo of the dress. On the other hand, the experiment on colour constancy revealed systematic differences in colour constancy across observers (in an asymmetric matching task). The results suggest that different observers expect different colour changes when the illumination changes. The differences in colour constancy were strongly correlated to the perception of the dress. These results reveal that the strong individual differences in the perception of the dress are a general feature of colour constancy. These findings highlight that colour perception is inherently variable and relative to the individual observer. They also suggest that the individual differences in colour constancy that have been attributed to measurement noise in previous studies, are likely to be due to systematic individual differences in the way observers identify colours across illumination changes. Additional findings from an ongoing study will be presented that clarify which specific aspects of colour constancy are at the source of those individual differences.

The influence of color distance perception on the red-attractiveness effect

Alica Bucher, Veronika Lerche, Malte Schott, Andreas Voss

Heidelberg University, Germany

In mostly all studies revealing a significant enhancing effect of the color red on attractiveness judgements, an evolutionary perspective was used as a possible explanation. The color phenomenon, termed chromostereopsis, has not yet been