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Keynote lectures

Control of Attention in Natural Environments

Mary Hayhoe
Center for Perceptual Systems, The University of Texas at Austin
hayhoe@utexas.edu

In the context of natural behavior, humans must allocate attention and select information from the visual scene to satisfy behavioral goals. What are the control mechanisms that achieve this? I will review the factors that control gaze in natural behavior, including evidence for the role of the task, which defines the immediate goals, the rewards and costs associated with those goals, uncertainty about the state of the world, and prior knowledge. Visual computations are often highly task-specific, and evaluation of task relevant state is a central factor necessary for optimal choices of where to direct gaze. This governs a very large proportion of gaze changes, which reveal the information sampling strategies of the human visual system. When reliable information is present in memory, the need for sensory updates is reduced, and humans can rely instead on memory estimates. Thus memory-based priors constitute another important determinant of natural gaze control.

Statistical learning drives visual selection

Jan Theeuwes
Experimental and Applied Psychology, Vrije Universiteit Amsterdam
Institute for Brain and Behavior Amsterdam (iBBA)
j.theeuwes@vu.nl

Humans are constantly bombarded by streams of sensory information. Selective attention determines what we attend and what ignore. Traditionally, it was thought that what we attend was determined by our top-down goals and the physical characteristics of the environment. Recently however, it was pointed out that this conceptualization may be incomplete as selection is likely to be the result our experiences, i.e., the history of attentional deployments can elicit lingering selection biases, unrelated to top-down goals or the physical salience of items. Invariant properties of the visual environment can bias attention such that we are able to interact more effectively with the visual world. Previous studies have shown that the efficiency of selecting the target can be improved when the target consistently appears at specific locations in the display (e.g., contextual cueing). This is not surprising as the target is relevant for the task and it is known that attention can be directed to locations in space. In this talk, however, I will specifically focus on how statistical regularities regarding items that are not relevant for the task (i.e., distractors) affect selection. We show that through statistical learning, locations that are likely to contain distractors are suppressed relative to all other locations. These statistical regularities drive selection above and beyond top-down and bottom-up control and operate without people being aware of them. We argue that statistical learning induces plasticity in time and place within the spatial priority map such that locations that are likely to contain a target are boosted and locations that are likely to contain a distractor are suppressed. It reflects our ability to extract the distributional properties of sensory input across time and space; one of the most crucial human abilities that plays a role in essentially everything we do.

Probabilistic models of sensorimotor control and decision making

Daniel Wolpert
Department of Engineering, University of Cambridge
wolpert@eng.cam.ac.uk

The effortless ease with which humans move our arms, our eyes, even our lips when we speak masks the true complexity of the control processes involved. This is evident when we try to build machines to perform human control tasks. I will review our work on how humans learn to make skilled movements covering probabilistic models of learning, including Bayesian and structural learning as well as the role of context in activating motor memories. I will also review our work showing the intimate interactions between decision making and sensorimotor control processes. This includes the bidirectional flow of information between elements of decision formations such as accumulated evidence and motor processes such as reflex gains. Taken together these studies show that probabilistic models play a fundamental role in human sensorimotor control.

Contributions

Investigating neurophysiological correlates of joint action

Hossein Abbasi, Dominik Dötsch & Anna Schubö
Philipps-Universität Marburg, Psychology department
hossein.abbasi@uni-marburg.de

In social interactions, people often share tasks with others. This type of interaction is usually examined in joint action tasks in which two humans are asked to perform an experimental task conjointly. In this research, we aimed to describe neurophysiological correlates of joint action. To this end, participants performed an orientation discrimination task in either a competitive or cooperative setting while their EEG data was recorded. On each trial, the display included two oriented targets with distinct colors indicating if it is the participant's own target, the partner's target, or neutral distractors. One of these stimuli was presented laterally to measure attention deployment by means of lateralized event-related potential components, while the other stimulus was presented on the vertical midline. In the ERP analysis, we observed an N2pc component in the parieto-occipital region when subjects are presented with their own target in Go trials. In the time-frequency analysis we found that the upper alpha band in the same region is more lateralized in the competitive condition compared to the cooperative condition. These results indicate that performing a task with a partner in different social contexts affects the way humans perceive their visual environment.

Swearing and Taboo Word Production: Behavioral and Electrophysiological Correlates

Rasha Abdel Rahman & Lana Rohr
Humboldt-Universität zu Berlin
rasha.abdel.rahman@hu-berlin.de

The selection of words that best express intended preverbal messages depends not only on semantic factors, but also on communicative contexts that determine the social appropriateness of verbal utterances. Specifically, the mental lexicon contains swear and taboo-words that, albeit being produced more or less frequently, are highly inappropriate and unwanted in many social situations. Thus, for the speaker it is essential to assess the appropriateness of planned utterances before articulation. In the present study we used electrophysiological measures to characterize the production of swear and taboo words. Compared to well-matched neutral words, swear and taboo words were produced slower and quieter, suggesting that the potential social inappropriateness affects pre-articulatory as well as articulatory stages during language production. In ERPs an early positivity at posterior regions is taken to reflect modulations of lexical access, and a later positivity at central regions suggests enhanced evaluative processes related to internal speech monitoring. Our findings demonstrate that the emotional valence and social appropriateness of swears and taboo words is appraised during speech planning at the level of lexical selection and via self-monitoring at a later stage. As a result of the latter, swear and taboo words are produced more hesitantly.

Potential models of allocentric coding for reaching in naturalistic visual scenes

Parisa Abedi Khoozani[1], Mathias Klinghammer[2], Paul Schrater[3], Dominik Endres[4], Katja Fiehler[2] & Gunnar Blohm[5]
[1]Queen's University, Center for Neuroscience; University of Giessen; [2]University of Giessen; [3]University of Minnesota; [4]University of Marburg; [5]Queen's University
0kpa@queensu.ca

Previous studies showed that the combination weight of allocentric and egocentric information is dependent on contextual factors when planning to reach to visual targets. However, the principles of this integration and the impact of different parameters are not clear. Therefore, we propose two modeling paradigms (global vs. local clustering) for allocentric coding to explain reported experimental data. The first model encodes the scene by creating a cluster point and calculates the distance of objects from this cluster. The second model creates Barycentric coordinates and encodes the position of the target object with respect to local clusters of objects. At the decoding phase, the goal is to infer the position of the target object from a new scene by taking into account remembered information from encoding. The first model makes this inference by combining the remembered egocentric cluster point, from encoding, and the new allocentric cluster point extracted from the new scene. The second model estimates the allocentric position of the missing object based on the new scene and then combines it with the remembered egocentric position. Both models reproduced the reported human data. Future experiments should examine which of these strategies, if any, the brain might use.

Confidence, distance, and consistency: Towards a reliability account of advice taking

Fabian Ache & Mandy Hütter
Eberhard Karls Universität Tübingen
fabian.ache@uni-tuebingen.de

Confidence is both an important determinant and outcome of advice taking. Specifically, lower confidence increases individuals' advice weighting. At the same time, advice that is close to an individual's initial judgment leads to an increase in confidence. What has not been investigated is how confidence affects and is affected by advice seeking. Across four experiments, we investigated individuals' confidence before and after seeking and taking advice. In all experiments, we manipulated advice distance either categorically (close vs. distant; Exp. 1 & 2) or continuously (Exp. 3 & 4). Additionally, we manipulated costs of advice (Exp. 2) and consistency of advice among advisors (Exp. 4). Lower confidence predicts increased advice seeking, beyond distance, costs, and consistency of advice. Close advice leads to an increase in confidence. Additional sampling increases this confidence gain, but more so when advice is consistent among advisors. The results are compatible with the assumption that advice seeking and utilization depend on the reliability (i.e., amount and consistency) of individuals' task-related knowledge and change thereof upon integration of advice. We propose this change of reliability as a common process underlying the effects of knowledge, confidence, advice distance, and advisor consistency on advice taking.

Is it possible to reverse the Spatial Agency Bias?

Katharina Adam, Tobias Vogel & Michaela Wänke
University of Mannheim, Consumer and Economic Psychology
katharina.adam@uni-mannheim.de

Spatial Agency Bias (SAB, Maass, Suitner, & Nadhmi, 2013) refers to people's tendency to perceive actions flowing from left to right in western countries. The SAB has multiple consequences with regard to human perception and cognition. Part of the SAB can be explained by word order. In a typical active sentence the grammatical subject represents an agent and precedes the object, e.g., Luca (subject) insults Giulio (object). Within most western languages, it is also possible to switch positions of agent and patient by using passive voice. Passive voice will also turn the patient into the grammatical subject and the agent into the object: E.g. Giulio (subject) was insulted by Luca (object). In two experiments, grammatical voice (active vs. passive) of a scene description was manipulated in a within-subject design (study 1) and a between-subject design (study 2). We replicated a preference for the agent on the left in the active voice condition. In the passive voice condition we found a preference for the agent on the right. Thus, we found evidence for a reversal of the Spatial Agency Bias.

The advantage of being less protected: children's spatial orientation in the city of Jakarta

Clara Ajisuksmo[1], Agustina Hendriati[1] & Eva Neidhardt[2]
[1]Atma Jaya Catholic University of Indonesia, Psychology; [2]Universität Koblenz-Landau, FB1
neidhardt@uni-koblenz.de

Path integration is a very basic cognitive competence: to update the spatial position while walking. Self-directed wayfinding experience is needed to develop this competence in children (Neidhardt & Popp, 2010). In Jakarta, the influence of parental protection on path integration competence was tested. Additionally, h a mental rotation test (PRT) and children's embedded figures test (CEFT) were given. Three groups of pre-school children (n=29) from very poor families were tested in three different places: The children walked along a path. At three locations on the forward run and on the same three locations on the way back they were asked to point to the origin of the path. Two of the groups consisted in children who are used to roam freely in their daily life. They managed this task extremely well. The third group – with more protective parents – did less well ($F(2,27)=9.72$, $p<.01$, $\eta 2=.42$). Although there are small significant correlations between spatial tests and path integration competence ($r=.23$ for the Picture Rotation Test, $r=.35$ for the embedded figures test), the experience of moving freely in everyday life is by far more important to explain path integration performances. Highly protected children are impaired in developing this very basic spatial competence.

Unstacking judgments: What response distributions reveal about the cognitive process in multiple-cue judgments

Rebecca Albrecht[1], Janina A. Hoffmann[2], Timothy J. Pleskac[3], Jörg Rieskamp[1] & Bettina von Helversen[4]
[1]University of Basel; [2]University of Konstanz; [3]Max Planck Institute for Human Development; [4]University of Zurich
rebecca.albrecht@unibas.ch

Exemplar and cue-abstraction models are well-established tools to understand categorization and judgment processes. However, many models in this area are limited by paying little attention to (1) the finding that judgments are often the result of a mixture of exemplar and cue-abstraction processes and (2) that in case of exemplar processes an outcome could be the results of a competitive retrieval process. We developed a new exemplar-based competition model with cue-abstraction (CX-COM) that addresses both these limitations. CX-COM assumes that past exemplars compete for retrieval and the retrieved judgments are adjusted following a cue-abstraction process. We tested the new model in two experimental studies. Across the two studies we found qualitative response pattern consistent with CX-COM's predictions. As predicted by a competitive retrieval mechanism underlying exemplar processing, judgment variability varied systematically with the distance in judgment values between likely retrieval candidates. Extrapolation and interpolation behavior was consistent with a cue-abstraction mechanism working in direct conjunction with exemplar retrieval. Qualitative results are corroborated by a quantitative analysis testing CX-COM against seven competitor models. The results suggest CX-COM as a viable new model for quantitative judgments and show the importance of considering variability in addition to mean values in judgment research.

Neo's spoon and Newton's apples: What material properties are part of object representations?

Lorilei M. Alley, Alexandra C. Schmid & Katja Dörschner
Justus-Liebig-Universität Gießen, Psychologie u. Sportwissenschaft
lorilei.alley@psychol.uni-giessen.de

Through repeated interactions with real-world objects, we develop priors about their properties. We rely on these priors to efficiently predict future outcomes (e.g. falling wine glasses may shatter), indicating that prediction ability is critical for survival. We investigated whether observers make predictions about the kinematics of materials based on object shape and surface properties. Stimuli were computer-rendered familiar objects (teacup, jelly, chair, etc.) that we hypothesized would generate strong expectations about their material kinematics when dropped from a height (shattering, melting, etc.). Utilizing a 'violation-of-expectation' paradigm, participants were shown videos of an object falling and impacting the ground. The motion was either 'congruent' with the object and material, behaving as expected (e.g. a falling Jelly wobbled), or 'incongruent', where the kinematics violated potential predictions (e.g. a falling Jelly wrinkled like cloth). Using a visual rating scale, observers rated each video on four adjectives: 'hard', 'gelatinous', 'heavy', and 'liquid'. We find that unexpected outcomes generate larger surprise effects/longer RTs, suggesting that kinematic properties of materials are an integral part of our representation of familiar objects.

Evaluative Blocking in EC

Hans Alves, Fabia Högden, Anne Gast & Christian Unkelbach
University of Cologne
hans.alves@uni-koeln.de

Evaluative conditioning describes the transfer of valence from a positive or negative stimulus to a neutral stimulus by mere co-occurrence (De Houwer, 2007). In research on classical conditioning and predictor-outcome learning, it is known that learning is not a mere function of CS-US co-occurrences but also influenced by interfering stimulus ccurrences (cue competition, e.g., blocking, highlighting, overshadowing). However, there is little research on stimulus interference in EC, a fact that has been described to hinder progress of explanatory concepts in EC (De Houwer, et al., 2001). The present work is a first step to close this gap and presents a novel, general, and robust effect of stimulus interference in EC. This effect is driven by the serial position of the CS and the redundancy of its USs with previously encountered CSs. In 5 experiments, we show that redundant (i.e., repeated) relative to non-redundant USs have a decreasing influence on the evaluation of the CS. This effect occurs even though repeated USs do not lose their affective potential and in spite of participants' more accurate memory for redundant compared to non-redundant CS-US pairings. We discuss different possible cognitive processes underlying the effect as well as implications for existing EC theories.

Impulsivity and inhibitory control in the context of Internet-pornography-use disorder

Stephanie Antons & Matthias Brand
University Duisburg-Essen, General Psychology: Cognition
stephanie.antons@uni-due.de

Individuals with Internet-pornography-use disorder (IPD) suffer from a loss of control over their Internet-pornography consumption albeit experiences of negative consequences. Following a recent theoretical model, impulsivity and inhibitory control are personality and cognitive factors that contribute to the development and maintenance of IPD. Moreover, inhibitory control might be affected by situational factors such as viewing pornographic cues. The current study aimed to investigate the role of impulsivity and inhibitory control on symptom severity of IPD. Fifty male, heterosexual, online-pornography users performed a modified stop-signal task measuring impulsive action tendencies and inhibitory control ability. The task includes two blocks, one with pornographic and one with neutral pictures. Impulsivity and symptom severity of IPD were assessed using questionnaires. The results show that males with high impulsivity and with high impulsive action tendencies when confronted with pornographic material also had higher symptom severity of IPD. However, this interaction effect of impulsivity and impulsive action tendencies on symptom severity was not present in the neutral picture condition. Results indicate that cognitive factors in specific situations such as viewing pornographic cues moderate the effect of personality on symptom severity of IPD. Results are discussed in the context of underlying neural mechanisms.

Altered network connectivity in ASD during emotional face processing

Robert Arent[1], Kristin M Zimmermann[1], Sanna Stroth[2], Inge Kamp-Becker[2] & Andreas Jansen[1]
[1]University of Marburg, Department of Psychiatry & Marburg Center for Mind, Brain and Behavior - MCMBB;
[2]Philipps-University Marburg, Department of Child and Adolescent Psychiatry
Arent@students.uni-marburg.de

A core symptom of people with Autism spectrum disorder (ASD) is weakness in social interaction and communicative abilities. One obstacle for the development of social skills may be down to an altered perception of human faces. People with ASD demonstrate difficulties with emotion recognition from faces and reveal deviant ways of focusing socially relevant face details. These behavioral alterations in ASD are assumed to arise from aberrant neural mechanisms. Recent structural and functional imaging studies point toward attenuations of the connectivity between face regions and regions involved in the processing of emotions in ASD. So far, however, all functional imaging studies applied correlation analysis techniques. Furthermore, most research focuses the face-dominant right hemisphere. With a different methodological approach, we investigate the effective connectivity between bilateral regions of the "core system of face perception" and the amygdala. The method, dynamic causal modelling (DCM) for fMRI, allows assertions about the direction of informational transfer, including feedback/feedforward loops. We aimed at differentiating lower-order perceptual from integrative perceptual-emotional mechanisms. Our results indicate an altered transfer of facial and emotional information from right to left FFA in people with ASD. Further, we found a reduced coupling of "core regions" of the face perception system.

When does background knowledge inform causal conditional reasoning?

Andre Aßfalg & Karl Christoph Klauer
Albert-Ludwigs-Universität Freiburg
andre.assfalg@psychologie.uni-freiburg.de

Some judgments involving conditionals (if p, then q) are well approximated with a causal model in which the antecedent (p) causes the consequent (q). Previous experiments suggest that participants rely on background knowledge to judge the strength of causal links and the probability of alternative causes. We tested the use of background knowledge in the suppression paradigm: Participants judged conditionals without cues or with cues that mentioned additional antecedents or alternative causes. We further manipulated whether participants could rely on background knowledge to inform their judgments. Typically, the suppression paradigm produces a distinctive data pattern such that Modus Ponens, for example, is suppressed if additional antecedents are mentioned. For the present experiment, we predicted that participants would exhibit the typical suppression pattern if experimental conditions prevented the use of background knowledge. Conversely, we expected a weaker suppression effect if participants could rely on their background knowledge. However, these predictions were not supported by the data. In the present experiment, a typical suppression pattern appeared, regardless of experimental condition. We conclude that reasoners' use of relevant background knowledge and the conditions of its use remain poorly understood and a puzzle for future research.

Gaze behavior as an indicator for user competence and state in human-technology interaction

Christiane Attig & Josef F. Krems
Chemnitz University of Technology, Department of Psychology (Cognitive and Engineering Psychology)
christiane.attig@psychologie.tu-chemnitz.de

In a world that is increasingly pervaded by technology, the ability to successfully interact with technology is of crucial importance for participation in everyday life. However, this interaction constitutes a challenge for a considerable amount of users with low technological competence. The growing field of affective computing offers fruitful methods to automatically recognize user competence and state and subsequently provide tailored assistance. However, rooting user competence and state recognition into psychological theory is currently incomplete. By introducing a framework of human-technology interaction from a perspective of self-regulation, we describe the behavioral and affective outcomes of the interaction between the user and the technical system as a function of task difficulty and coping resources (e.g., task competence, system competence). As a first step to experimentally test the framework, we investigated users' (N = 72) gaze behavior as a possible information source for automated state and competence recognition. Participants with different competence levels solved four tasks with varying task difficulty in the statistic software SPSS. Results indicated that gaze behavior varies with task difficulty, users' task and system competence as well as with self-reported user state.

Fixation durations in natural scene viewing are guided by peripheral content

Charlotte Atzert[1], Antje Nuthmann[2] & Wolfgang Einhäuser[3]
[1]Chemnitz University of Technology, Institute of Physics – Physics of Cognition Group; Philipps-University; [2]University of Kiel, Institute of Psychology – Perception and Cognition Group; [3]Chemnitz University of Technology, Institute of Physics – Physics of Cognition Group
wolfgang.einhaeuser-treyer@physik.tu-chemnitz.de

Fixation durations provide insights into processing demands; however, for free-viewing of natural scenes, data on the factors controlling fixation durations are relatively scarce. Here, we investigate the relationship between fixation durations and image features. In experiment 1, observers viewed images of natural scenes and experimentally modified versions. We varied scene contrast (from original contrast to isoluminant) and saturation (from original saturation to grayscale). Fixation durations increased with decreasing contrast; moreover, at low contrasts, fixation durations were prolonged when color information was absent. In sum, fixations durations increased when less information (color or contrast) was available. In experiment 2, we tested whether this difference resulted from increased processing demands at fixation or from reduced salience at peripheral locations. We designed "checkerboard" stimuli, for which half of the checks contained the unmodified scene, while the remaining checks were made isoluminant preserving color. Fixation durations were substantially prolonged when the next fixation fell on an isoluminant check. By comparison, the manipulation at current fixation had a small effect. Our results highlight the importance of peripheral information in controlling fixation durations. The data concur with the notion that gaze is guided by competition among the current and potential future fixation locations.

Should I sit or should I stand – On the relevance of motor demands on decision making under objective risk

Heike Averbeck[1], Magnus Liebherr[1], Patric Schubert[2] & Matthias Brand[1]
[1]University of Duisburg-Essen, Department of General Psychology: Cognition; [2]Hochschule Fresenius, University of Applied Sciences, Faculty of Health and Social Sciences
heike.averbeck@uni-due.de

Previous studies out of the field of decision making focused on the influence of additional cognitive task performance, stress, diseases, and the process of aging. For some reason the effects of simultaneously performing motor demands have been widely neglected. However, previous motor / cognitive dual-task studies provide evidence for both negative as well as facilitating effects of simultaneously performing cognitive and motor tasks. The study at hand aimed to investigate the effects of decision making under objective risk while performing additional motor demands. Seventy-two participants ranging from 18-30 years performed the Game of Dice Task either while sitting or while standing on one leg. The results revealed a significant main effect for 'choice', as well as a significant interaction of 'choice' x 'group'. People standing on one leg more frequently selected the most disadvantageous choice (one single number), whereas the sitting group most often selected the advantageous combination of four numbers. The findings at hand need to be considered under the aspects of executive functions, working memory, stress and somatic markers. Furthermore, the findings highlight an increasing relevance of the impulsive system in dual-task decision making under objective risk.

Is EC possible for objectively aware, but subjectively unaware CSs?

Karoline Corinna Bading & Christoph Stahl
University of Cologne, Department of Psychology
kbading@uni-koeln.de

Evaluative conditioning (EC) refers to the phenomenon that neutral stimuli (CSs) are evaluated more positively (negatively) after repeated co-occurrence with positive (negative) stimuli. The question of whether EC can occur under subliminal CS presentation is of great theoretical importance, as subliminal CS presentation precludes conscious awareness of the CS-US contingency. Propositional accounts of EC require CS-US contingency awareness and therefore cannot explain subliminal EC. Establishing EC under subliminal conditions would strongly support the assumption of a second non-propositional learning process. Previous research did not find subliminal EC when CSs were presented below the objective awareness threshold. The present research investigates subliminal EC using a subjective criterion of conscious awareness – participants' impression of (not) having seen the CS. Subjective awareness is assumed to lag behind objective awareness, and hence allows for higher CS durations. It therefore constitutes a fairer test of subliminal conditioning. In a series of experiments we found that EC was possible under supraliminal conditions with suboptimal visibility, but obtained mixed results for conditions which were subliminal according to the subjective criterion of conscious awareness. We discuss potential features of the learning procedure that may moderate subjectively subliminal EC.

Simon and his friends: Evidence for multiple reference frames

Pamela Baess & Christina Bermeitinger
University of Hildesheim, Institute of Psychology
baessp@uni-hildesheim.de

Studies using the Simon task have consistently reported faster stimulus-response compatible trials referring to the compatibility in regard to the body midline of the responding agent (egocentric). We have recently developed a variant of the Simon task (Baess & Bermeitinger, submitted) simultaneously allowing the formation of multiple spatial reference frames. Using stick-figure manikins as stimuli, we found evidence for Simon effects based on the egocentric and allocentric (ball in the left or right hand of the manikin) reference frame, which were further modulated by a non-spatial reference frame (one manikin vs. nine manikins). Here, we present a new series of experiments using photos of human agents as stimuli. In line with those results from the stick-figure manikins, egocentric and allocentric Simon effects were obtained. However, the allocentric Simon effect was inverted providing evidence for taking the human agent's perspective on the photo into account (e.g., my right hand equals his right hand). Implications will be drawn on basis of the findings from the stick-figure manikin and the human agent experiments.

Language Effects in Top-Down Search for Colors

Diane Baier & Ulrich Ansorge
University of Vienna, Department of Basic Psychological Research and Research Methods
diane.baier@univie.ac.at

To investigate the role of language in top-down search for colors, I compared different color and color-word stimuli in a series of contingent capture experiments. The contingent capture hypothesis states that attention capture depends on the match between stimulus and top-down search template. Attention capture is reflected in shorter search-times for validly than invalidly cued targets, selectively for top-down matching cues. In experiments 1 and 2, I compared effects of color cues and color-word cues in top-down search for a color target (experiment 1) or a color-word target (experiment 2). Only cues of the same stimulus category as the target (color stimuli/color-word stimuli) captured attention. In experiment 3, both color and color-word targets were combined in one experiment. In line with experiments 1 and 2, contingent capture effects emerged exclusively for targets of the same stimulus category as the cue. These results support feature-based rather than language-based search templates. In experiment 4, I compared color-word cues of different fonts. As color-word cues captured attention regardless of the match between cue and target font, search templates cannot solely be based on feature representations. Further investigations regarding phonological and semantic aspects will narrow down the role of language in top-down search templates.

Time course of inhibition in motor imagery

Victoria K. E. Bart[1], Iring Koch[2] & Martina Rieger[1]
[1]UMIT, Institute of Psychology; [2]RWTH Aachen University, Institute of Psychology
victoria.bart@umit.at

Motor imagery (MI) entails the mental simulation of movements without their actual execution. One mechanism contributing to inhibition of actual execution is effector-specific inhibition. We investigated the time course of effector-specific inhibition by analyzing trial sequence effects of imagined and executed hand movements from two start buttons to two target buttons. Response stimulus intervals (RSIs) were manipulated. Thus, trial sequences differed depending on current action mode (imagination, execution), previous action mode (imagination, execution), hand (same, different), target (same, different), and RSIs (200ms, 700ms, 1300ms, 2000ms). Results showed that in imagination-imagination sequences hand repetition costs occurred at the shortest RSI. This indicates that effector-specific inhibition occurred in the previous trial, resulting in costs when the same effector was used in the current trial. With increasing RSIs hand repetition costs decreased and eventually disappeared, indicating that effector-specific inhibition might decay over time. At the longest RSIs hand repetition benefits occurred. In execution-execution sequences hand repetition benefits were observed in all four RSIs. In conclusion, effector-specific inhibition and effector-specific activation may occur simultaneously in motor imagery. Effector-specific inhibition may be initially stronger, but may decay faster than effector-specific activation.

Lateralized alpha-power indicates selective forgetting in a retro-cuing paradigm

Anna Barth[1], Edmund Wascher[1], Clayton Hickey[2] & Daniel Schneider[1]
[1]Leibniz Institut für Arbeitsforschung an der TU Dortmund (IfADo), Ergonomie; [2]Center for Mind/Brain Sciences (CiMeC), University of Trento
barth@ifado.de

Attentional shifts based on retroactive cues (retro-cues) facilitate performance in working memory (WM) tasks. However, the contribution of target enhancement vs. distractor suppression mechanisms of attention are still unclear. Therefore, we measured lateralized effects of the EEG during a delayed estimation WM task. A retro-cue indicated the lateralized or midline item to be required for retrieval. Analyses revealed an increase of alpha power contralateral to a lateralized item becoming irrelevant after cuing while no comparable effect was observed when a lateralized target had to be selected. This indicates the inhibition of the irrelevant information as a core mechanism of selective attention within working memory. In contrast, target enhancement processes were evident in an anterior contralateral negative shift of the ERPs. These results enable a first impression on the interplay of attentional sub-processes in the context of visuo-spatial working memory updating.

Blind-walking and distance estimation

Julia Bastian
Universität Trier
bastian@uni-trier.de

What happens if pedestrians look at their mobile phones and not at the environment especially the traffic around them. Not only car drivers but also pedestrians are an important part of the traffic in cities and cause accidents by not estimating distances correctly. In our field experiment we wanted to know if participants estimate distances in three blind-walking conditions differently. 90 participants were assigned randomly to three different groups with 30 persons in each group: walking forward, walking forward and wearing a backpack or walking backward blindly. Each participant had to guess 8 distances between 4 and 45 meters varied according to a Latin square. Every person had to walk blindly until the thought reaching of the distance. Experimenters measured the walked distance. In a 2 distance (short(4 m, 8 m, 12 m, 16 m, 20 m) vs. long (35 m, 40 m, 45 m)) X 3 conditions MANOVA significant mean effect of distance ($F(1, 86) = 383.981$, $p < .000$, ?p2 = .817) and a significant interaction between distances and conditions ($F(2, 86) = 4.683$, $p = .012$*, ?p2 = .098) was found. Post Hoc comparisons of Tukey show a significant difference between the conditions of blind-walking forward and backward.

Clear moral judgments based on unclear evidence: Person evaluation is strongly influenced by untrustworthy gossip

Julia Baum, Milena Rabovsky, Sebastian Rose & Rasha Abdel Rahman
Humboldt-Universität zu Berlin, Institut für Psychologie, Neurokognitive Psychologie
julia.baum@hu-berlin.de

Affective information about other people's social behavior may prejudice social interactions and bias moral judgments. The trustworthiness of person-related information, however, can vary considerably, as in the case of gossip, rumours, lies, or so-called "fake news". Here, we investigated how spontaneous person-likeability and explicit moral judgments are influenced by trustworthiness, employing event-related potentials as indexes of emotional brain responses. Social-emotional information about previously unknown persons was verbally presented as trustworthy fact, (e.g. "He raped a woman") or marked as untrustworthy gossip (by adding e.g. allegedly). In Experiment 1, spontaneous likeability, deliberate moral judgments and electrophysiological measures of emotional person evaluation were strongly influenced by negative information, yet remarkably unaffected by the trustworthiness of the information. Experiment 2 replicated these findings and extended them to positive information. Our findings demonstrate a tendency for strong emotional evaluations and moral judgments even when they are knowingly based on unclear evidence.

Explaining human decision making in optimal stopping tasks

Christiane Baumann[1], Bettina von Helversen[1] & Sam Gershman[2]
[1]University of Zuerich, Department of Psychology; [2]Harvard University, Departement of Psychology
c.baumann@psychologie.uzh.ch

Optimal stopping problems are a class of decision-making tasks in which people have to choose the best option out of a set of alternatives. Options are presented sequentially and a rejected option cannot be recalled. Behavioral research has found that human choices can be described by threshold strategies. Despite their descriptive strength threshold models are agnostic to the underlying cognitive processes that guide human behavior in an optimal stopping task. Here, we use a drift diffusion model (DDM) to understand how preferences change over the sequence and which cognitive processes drive them. In an online experiment, participants performed a sequential decision-making task in which they had to find the cheapest airplane ticket out of 10 tickets. We varied the value of the options and on which positions they were presented. In a second step we fitted the DDM to the data. The drift rate increased with position in the sequence and cheaper offers. But neither value nor position had an effect on the bias or threshold parameter. These results suggest that people may not decrease their decision threshold, but rather discount future options due to increasing uncertainty over the sequence.

Perzeptuelle Sichtbedingungen beeinflussen unsere Fähigkeit, adäquat auf ein versagen automatisierter Fahrfunktionen zu reagieren

Martin Baumann[1] & Lewis Chuang[2]
[1]Universität Ulm, Germany; [2]Max Planck Institute for Biological Cybernetics
lewis.chuang@tuebingen.mpg.de

Zukünftige automatisierte Fahrzeuge (d.h., SAE-L3 und höher) sollen es Fahrern ermöglichen, Aktivitäten auszuführen, die nicht fahrrelevant sind, und dabei ihre Aufmerksamkeit nicht durchgängig der Überwachung der Fahrsituation widmen zu müssen. Hinter diesem Ziel steht die implizite Annahme, dass diese automatisierten Fahrzeuge (i) erkennen, wenn sie ihre Systemgrenzen erreichen bzw. ausfallen, und (ii) die Fahrer rechtzeitig zur Übernahme der Fahraufgabe auffordern. Die Frage dieses Forschungsprojekts ist: Können Fahrer adäquat eingreifen, wenn die Automation versagt und die Fahrer mit einer fahrirrelevanten Aktivität beschäftigt sind und keine Warnung durch die Automation erfolgte, weil sie ihr Versagen nicht erkannte? 20 Teilnehmer führten während einer simulierten Fahrt mit einem automatisierten Fahrzeug in einem Fahrsimulator eine verbale komplexe Gedächtnisspannen-Aufgabe aus und mussten eingreifen, sobald die Automation ohne Warnung ausfiel. Die Sichtbedingungen wurden variiert (klar vs. nebelig) und ein LED-Display zeigte die augenblickliche Reliabilität der Automation an (niedrig vs. hoch). Die Ergebnisse zeigen, dass die Teilnehmer schneller unter nebeligen Sichtbedingungen auf ein Automationsversagen reagierten als bei klarer Sicht. Die angezeigte Reliabilität der Automation hatte keinen Effekt. Diese ersten Ergebnisse weisen darauf hin, dass Umweltbedingungen, die die Fähigkeit, rechtzeitig einzugreifen, beeinflussen, einen größeren Einfluss auf das Übernahmeverhalten haben als präsentierte Informationen über die Ausfallwahrscheinlichkeit der Automation.

I'm all ears: ERPs and pupil size in response to learning novel labels for novel sounds

Markéta Becevová, Natalia Esther Brandwayn, Scheng Yang Chong, Maria del Mar Cordero Rull, Matteo Mascelloni, Marisa Ortlieb, Leonardo Pimpini, Susanne Schuberth, Paola Suarez Ramirez & Jutta L Mueller
Universität Osnabrück
nbrandwaynbr@uni-osnabrueck.de

Previous research using behavioural measures or ERPs has shown that the meaning of words can be learned by a variety of cues and procedures. Yet, whether and how the modality of the referential cue impacts on the outcome of measures of learning has not been investigated up to date. In order to address this gap, we tested the lexical-semantic learning abilities of adults during word-sound association learning. Participants' EEG and pupil size were recorded during an experiment with a training phase and a subsequent testing phase. The training phase was composed of a passive listening task in which participants were exposed to consistent and inconsistent word-sound pairs. The following testing phase contained congruent and incongruent pairs from both item categories. We will report learning-related changes over time and effects related to consistency of sound pairs. Further, the reported data will show whether the expected ERP measure, the N400, is correlated to pupil size during learning and testing. The data will provide first evidence on how novel meanings related to non-visual referents can be mapped to novel words. Further research could aim to study this specific associative learning modality in different age ranges and contexts.

The role of sensorimotor experience in the formation of novel word meanings

Laura Bechtold[1], Marta Ghio[1], Gerald Antoch[2], Bernd Turowski[2], Hans-Jörg Wittsack[2], Marco Tettamanti[3] & Christian Bellebaum[1]
[1]Heinrich-Heine-University, Biological Psychology; [2]Heinrich-Heine-University, Diagnostic and Interventional Radiology; [3]IRCCS San Raffaele Scientific Institute, Nuclear Medicine and Division of Neuroscience
labec100@hhu.de

Embodied cognition theories postulate that conceptual processing partly recruits the same brain areas as the experience with the concept's referent. Supportive evidence arose from training-studies, in which laboratory-controlled experiential information was integrated in conceptual representations of novel objects. This study aimed to extend these findings to the linguistic domain. In three training sessions, 22 participants gained active manipulation or merely visual experience with novel tool-like objects while learning names (pseudo-words) referring to the objects. In a post-training fMRI session, the novel object names had to be distinguished from unfamiliar pseudo-words in a lexical decision task. Novel object names activated a broad semantic network comprising frontal, parietal and temporal regions, mirroring the activation pattern elicited by processing real object names. Pseudo-word processing elicited medial-superior parietal activations when compared to novel as well as real object names. Thus, training seemingly induced word meaning by linking novel names to newly formed conceptual object representations, comparable to real word meaning. However, the activation pattern did not differentiate between manipulation and visual experience. The activation elicited by novel object name processing after three training sessions seemingly reflects a preliminary stage in conceptual representation formation, not yet distinguishing between the types of experiential information.

HPA axis and SNS activity are differentially related to the primacy and recency effect of the serial position curve

Linda Becker, Kristina Sinner & Nicolas Rohleder
Friedrich-Alexander-Universität Erlangen-Nürnberg, Institute of Psychology
linda.becker@fau.de

The aim of our study was to investigate whether the diurnal rhythm of cortisol, as an indicator for hypothalamic-pituitary-adrenal (HPA) axis activity, or the diurnal rhythm of salivary alpha-amylase (sAA), as an index for the activity of the sympathetic nervous system (SNS), are related with long-term memory or working memory performance in adults with subclinical levels of chronic stress. For this purpose, the primacy effect and the recency effect of the serial position curve were investigated. Participants were n = 67 healthy adults who reported that they did not perceive their lives as stressful (mean age: 24.9 ± 8.4 years; n = 23 male). For cortisol, the area under the curve (AUC), as an index of whole daily cortisol concentration, was negatively related with the primacy effect (as an indicator for long-term memory performance; $r = -.28$, $p < .05$). For sAA, positive relationships were found of AUC and diurnal increase of sAA concentrations throughout the day with the recency effect (as an indicator for working memory capacity; $r = .25$ and $r = .29$, both $p < .05$). We conclude that both stress pathways affect long-term memory and working memory processes differently.

The link between social categorization and prejudice: A matter of the situationally activated mental contents?

Manuel Becker[1], Sarah Teige-Mocigemba[2], Jeffrey W. Sherman[3] & Karl Christoph Klauer[1]
[1]Albert-Ludwigs-Universität Freiburg, Institut für Psychologie, Abteilung für Sozialpsychologie und Methodenlehre; [2]Philipps-Universität Marburg, Fachbereich Psychologie, AG Persönlichkeit und Diagnostik; [3]University of California, Davis, Department of Psychology, Social Cognition Lab
manuel.becker@psychologie.uni-freiburg.de

Previous research has produced conflicting evidence for the extent to which social categorization contributes to a person's prejudice apart from being a necessary condition for it (cf., e.g., Park & Judd, 2005). In two studies (joint N=200), one exploratory, the other confirmatory, we advance the hypothesis that the context in which outgroup members are encountered is an important moderator of the relationship between categorization and prejudice: More specifically, the amount to which participants process category information in a discussion in the "Who Said What?" paradigm (Taylor et al., 1978) covering topics where it is an asset to be black was reliably associated with positive evaluations of blacks in an Evaluative Decision Task (Fazio et al., 1995). This association was reversed for topics where it might be seen a detriment to be black. We suggest several avenues how subsequent research might explore the causal relationship between categorization and prejudice (e.g., does the extent of prejudice determine the extent to which people process either negative or positive information about the outgroup?). So far, we interpret our tentative results as suggesting that categorization needs to remain a viable player in theoretical accounts of prejudice.

The effect of auditory distractors on face recognition

Raoul Bell, Jan Philipp Röer, Laura Mieth & Axel Buchner
Heinrich-Heine-Universität Düsseldorf
raoul.bell@hhu.de

It is well established that verbal short-term memory is disrupted by auditory distractors. The changing-state effect refers to the observation that sequences of different auditory distractors disrupt performance more than distractor repetitions. The interference-by-process account claims that the automatic processing of the auditory distractors selectively interferes with the short-term maintenance of order information. The attentional account, in contrast, assumes that distraction occurs because attention is diverted away from the primary task, suggesting that the auditory distractors generally disrupt memory binding. Here, we examined whether face recognition is affected by the presentation of auditory distractors at encoding. Faces were encoded either in quiet or while word repetitions or short sentences had to be ignored. In a subsequent face recognition test, faces encoded in quiet were better recognized than faces encoded in background noise, suggesting that the binding of facial features was impaired by auditory distraction. Face recognition was more impaired by sentences than by word repetitions, showing that the changing-state effect generalizes beyond verbal material. The results have important theoretical as well as applied implications that are discussed.

Reward Driven Visual Attentional Capture in Adult ADHD Patients

Philipp Matthias Berg[1], Hanna Christiansen[2] & Anna Schubö[3]
[1]Philipps-Universität Marburg, Psychologie; [2]Child- and Youth Psychology, Philipps-University Marburg; [3]Experimental and Biological Psychology, Philipps-University Marburg
philipp.berg@staff.uni-marburg.de

Clinical research on ADHD demonstrates that patients with ADHD process reward different compared to healthy controls. Studies on visual selective attention have demonstrated that reward can influence visual search performance in various ways e.g. distractors signaling reward can decrease search performance. We assumed that search performance might decrease stronger in patients with ADHD than in healthy controls. A visual search task was adopted from a study by Feldman-Wüstefeld, Brandhofer and Schubö (2016). It consisted of homogenous or heterogeneous contexts in which an orientation target and a colored distractor were embedded. After each correct trial participants were given a monetary reward that depended on the color of the distractor. Target response times and questionnaire data were assessed. Preliminary results showed prolonged response times for targets in heterogeneous and homogenous context in the ADHD group compared to the control group. However, contrary to our assumption, no reward induced interference was observed for the ADHD group in comparison to the healthy controls. From these results we conclude that patients with ADHD take longer than healthy controls to acquire reward contingencies.

Evaluative conditioning of neutral stimuli does not modulate conflict adaptation

Anja Maria Berger[1], Rico Fischer[2] & Gesine Dreisbach[1]
[1]University of Regensburg, Institute for Psychology; [2]University of Greifswald, Institute for Psychology
anja.berger@psychologie.uni-regensburg.de

There is much evidence that cognitive conflicts are experienced as aversive (c.f., Dreisbach & Fischer, 2015). A recent study suggests that the subjective affective conflict experience modulates sequential conflict adaptation (Fröber, Frömer, Stümer & Dreisbach, 2017). To gather more insight into this functional role of the aversive conflict signal, we directly manipulated the affective valence of single stimuli by way of evaluative conditioning (EC). In two experiments, during an EC phase, four stimuli were consistently paired with affective (Experiment 1: negative; Experiment 2: positive) pictures, and four stimuli with neutral pictures. These stimuli (without pictures) were used for a subsequent Simon-conflict task. Reaction times (RT) and error rates were analyzed according to EC in trial N-1 (yes/no), compatibility in N-1 (compatible/incompatible), and compatibility in N. Results of both experiments showed increased Simon effects following affective EC stimuli (in RTs and errors) which was driven mainly by increased conflict effects following compatible trials. The typical reduction of the Simon effect following incompatible trials was virtually unaffected by EC. While EC stimuli did not affect conflict adaptation, the lack of specific valence effects suggests that EC created rather unspecific distraction than variation in subjective conflict experience and calls for further experimentation.

Assessing the nature of ambivalent attitudes: Can positive and negative valence be activated simultaneously?

Katharina Theresa Berger[1], Mandy Hütter[1] & Olivier Corneille[2]
[1]Eberhard Karls Universität Tübingen; [2]Université catholique de Louvain
katharina-theresa.berger@uni-tuebingen.de

We conducted two studies (N1 = 77, N2 = 80) to test a central assumption of attitude ambivalence research: ambivalent attitude objects automatically and simultaneously trigger positive and negative evaluative reactions. In both experiments, participants completed two evaluative priming paradigms, in which ambivalent stimuli served either as primes or as targets. The ambivalent targets paradigm tested the degree to which positivity or negativity is activated in ambivalent targets depending on prime valence. In contrast, the ambivalent primes paradigm tested the degree to which the concurrent and unintentional activation of positivity and negativity influences responding to univalent targets. In a multilevel analysis, both paradigms in both studies yielded response inhibition for ambivalent trials that resulted in response times similar to incongruent trials. Furthermore, ambivalent targets were equally often classified as positive and negative, the findings for dependency on prime valence, however, were inconsistent across the studies. Our findings lend original empirical support to the assumption that positivity and negativity are activated simultaneously in ambivalent attitude objects, thereby resulting in a response conflict that has to be resolved.

Modulation of context learning by anticipated reward magnitude

Nils Bergmann, Dennis Koch & Anna Schubö
Philipps-University Marburg, Cognitive Neuroscience of Perception and Action, Department of Psychology
nils.bergmann@uni-marburg.de

Anticipated reward can bias selective attention in visual search. There is evidence that also learning of context regularities can be modulated by expected reward magnitudes, although results have been ambiguous. We examined the influence of anticipated reward magnitudes on context configuration learning in a visual search task. Participants performed a contextual cueing task in which half of the context configurations were repeated over the course of the experiment and the other half was novel in each trial. In all context configurations some context elements were colored. Color was neither response relevant nor predictive of the target location but signaled reward magnitude, with reward transferring into a monetary bonus. Results showed faster responses to the targets presented in repeated compared to novel context configurations, an effect which was further speeded in those contexts that were associated with high reward compared to medium or low reward magnitude. In addition to faster response times, eye movements indicated that this effect went along with modulations of the first fixation, which landed closer to the individual target location when contexts were associated with high reward. These results provide evidence for prioritized attention guidance dependent on the expected reward magnitude.

The Influence of Perceived Remorse on Source Memory for Faces: A Multinomial Processing Tree Approach

Jana Berkessel[1] & Friederike Funk[2]
[1]University of Mannheim, Department of Psychology; [2]University of Cologne, Department of Psychology
jana.berkessel@uni-mannheim.de

Whether a face is perceived as remorseful can have mitigating effects on punishment judgments (e.g., MacLin, Downs, MacLin, Caspers, 2009). Yet, little is known about underlying memory processes for these faces. Previous findings on memory processes may suggest both a memory advantage for remorseful, emotional faces (e.g., Cahill & McGaugh, 1995, for emotional stimuli) and for remorseless, threatening faces (e.g., Kensinger, 2009, for threatening stimuli). Funk and Englich (2016) demonstrated a non-existent recognition sensitivity for remorseful faces, on the one hand, and a memory advantage for remorseless faces, on the other hand. However, this research did not vary facial expressions in the recall phase, making it impossible to interpret whether participants remembered the facial expression or the person expressing it. Using a source memory paradigm, the current study allows differentiating between item memory and source memory for the facial expression of remorse or the lack thereof. It investigates whether participants remember the facial expression of remorseful faces but the person behind the expression for remorseless faces, as people who are remorseless still pose a threat to oneself.

Green as a cbemcuru: visual color cues can help to solve anagrams

Eduard Berndt, Carolin Dudschig & Barbara Kaup
University of Tübingen, Department of Psychology
eduard.berndt@uni-tuebingen.de

A growing number of empirical studies on language comprehension suggest that multimodal experiential traces (auditory, visual or motor) associated with a word's referent are activated upon reading or hearing a word. The corresponding influence in the opposite direction has received far less attention: Can a sufficient activation of these experiential traces also activate certain words that are associated with them? To investigate this, we conducted a web-browser based experiment, where participants had to solve anagrams, resulting from scrambling the letters of a word, with the solution word's referent being strongly associated with a particular color (e.g., cucumber being associated with the color green). Prior to presenting each anagram, a color patch was shown, either matching or mismatching the color associated with the solution word's referent. Solution times for the anagram task were shorter in the matching than in the mismatching condition, indicating that a matching color cue indeed facilitated access to the solution words. These results further strengthen the notion that multimodal experiential traces play an important role in language comprehension and expand upon the results of earlier studies on anagram solution tasks by showing an influence of modal traces on anagram solution times.

Lifespan Cognition

Daniel M. Bernstein[1] & Daniel G. Derksen[2]
[1]Kwantlen Polytechnic University; [2]Simon Fraser University
dbernste@kpu.ca

This study explored cognition across the lifespan. Participants (N = 560, Range = 3 – 89 years; 62% female) completed a battery of tasks measuring language ability, executive function (inhibitory control and working memory), social cognition (theory of mind and hindsight bias), and decision making (sunk-cost fallacy and risk aversion). Wherever possible, all participants completed the identical tasks. Data from year 1 of a 4-year longitudinal project reflect different developmental patterns for different constructs. Language ability, working memory, and theory of mind improved with age. Performance on the sunk-cost fallacy declined with age. Hindsight bias and risky decision making followed U-shaped patterns: Preschoolers and older adults showed more hindsight bias and less risky decision-making than older children and younger adults. These different developmental patterns likely result from differences in crystallized versus fluid intelligence across the lifespan.

Hierarchical modeling of mechanisms underlying the sleep benefit in episodic memory: Disentangling storage and retrieval contributions

Sabrina Berres, Edgar Erdfelder & Julian Quevedo Pütter
University of Mannheim, Department for Cognitive Psychology and Individual Differences
sberres@mail.uni-mannheim.de

Previous research has shown that sleep enhances episodic memory. One explanation of this finding maintains that sleep reduces retroactive interference. Because retroactive interference has been shown to be associated with retrieval problems, sleep should improve retrieval from memory according to this explanation. A more recent explanation states that labile memory traces are stabilized during sleep, resulting in memory consolidation. Hence, this explanation predicts that sleep improves storage. To disentangle storage and retrieval contributions, we propose the Encoding-Maintenance-Retrieval multinomial model which provides separate measures for successful encoding of word-pair associations (e), maintaining encoded associations across the retention interval (m), and retrieving stored associations (r). We manipulated (1) sleep vs. wakefulness during retention and (2) ease-of-retrieval at test experimentally. Our results support the model's validity by showing that ease-of-retrieval affects the retrieval probability r selectively. We also found that sleep improves both storage (m) and retrieval (r). By using a hierarchical modeling approach, we account for individual differences in encoding, maintenance and retrieval as well as their variances and correlations. Moreover, this approach allows us to relate those differences to chronobiological differences in the preference towards Morningness or Eveningness.

Beliefs versus Fluency? Comparison of the Mechanisms Underlying the Perceptual Fluency Finding through Object Images

Miri Besken
Bilkent University, Psychology Department
mbesken@bilkent.edu.tr

In recent years, research has typically shown that perceptually fluent stimuli produce higher judgments of learning (=JOLs) than perceptually disfluent stimuli. This finding is sometimes explained by subjective online disfluencies that the participant experiences during the encoding of disfluent stimuli. In contrast, analytic processing hypothesis claims that participants generate certain beliefs about the ongoing task and they rate the memorability of the stimuli according to these beliefs. In the current study, objects images were presented to the participants in three conditions in a within subjects design: intact, half and fragmented presentation. Participants were asked to identify the objects as quickly as they can, followed by JOL ratings during encoding. At test, they were instructed to recall the names of the objects. Participants identified the fragmented objects significantly slower than the other two conditions. However, they gave the lowest JOL ratings to half-presented objects. Hence, identification latency and JOLs were not linearly correlated. Free-recall did not significantly differ across encoding conditions. The lack of linear relationship between the JOLs and identification latency provides support for the analytic processing theory.

Does it pay to pay? Experimental evidence on cognitive control by monetary rewards versus response strategies

Maik Bieleke[1], Michael Dambacher[1], Ronald Hübner[1] & Peter M Gollwitzer[2]
[1]University of Konstanz, Department of Psychology; [2]New York University, Department of Psychology
maik.bieleke@uni-konstanz.de

Monetary rewards can increase the efficiency of cognitive control. It is, however, unclear whether simple response strategies can achieve similar effects. We addressed this question with a Flanker paradigm in which target stimuli flanked by (response-congruent or response-incongruent) distractors had to be categorized as quickly and accurately as possible. Participants either received larger monetary rewards for efficiently categorizing a critical versus non-critical targets (reward condition) or formed an if-then response strategy to categorize the critical target efficiently (strategy condition). When targets did not belong to the set of distractor stimuli (Experiment 1), participants in both conditions were similarly able to categorize the critical target more efficiently than non-critical targets. However, differences between conditions emerged when the same set of stimuli was used for targets and distractors (Experiment 2). Compared to participants in the strategy condition, participants in the reward condition were more heavily influenced by a critical target appearing as distractor (i.e., amplification of the congruency effect). Our results suggest that both monetary rewards and simple response strategies can foster the efficiency of cognitive control. Yet, compared to response strategies, monetary rewards seem to promote more stimulus-driven processes, which are less sensitive to task demands.

Action verb – reaction – interaction: behavioural and brain data

Katja Biermann-Ruben, Anne Klepp, Valentina Niccolai & Alfons Schnitzler
Heinrich-Heine-Universität, Institut für Klinische Neurowissenschaften und Medizinische Psychologie
Katja.Biermann-Ruben@med.uni-duesseldorf.de

If and how the brain areas responsible for primary modalities such as vision, audition, somatosensation and motor execution are involved in concept formation and language processing has been a matter of debate for quite some time - and still is. Our group further explored the processing of action verbs in different experimental setups using language processing and motor execution interaction paradigms. Behavioural and neurophysiological data point at a substantial overlap of neuronal engagement for language processing and movement execution. Behaviourally, prolongation of reaction times emerges when short SOAs between language stimulus and response cue (~ 150 ms) are implemented thus suggesting interference mechanisms. On the other hand facilitation effects are observed for longer SOAs of about 400 ms. Interaction processes also appear in the modulation of 20-Hz beta-frequency range neuronal oscillations. Decreased beta suppression appears to be a correlate of overlapping cortical activation induced by the semantic congruency between a linguistic stimulus and the response effector. Some effects are only present in high-performing subjects, which points at a further role of attentional processes. We conclude that conceptual language processing recruits primary processing areas (here: motor), however the amount depends on task details such as stimulus timing and cognitive requirements.

Age-related differences in gesture perception and production

Jutta Billino[1], Miriam Steines[2], Arne Nagels[3], Tilo Kircher[2] & Benjamin Straube[2]
[1]Allgemeine Psychologie, Justus-Liebig-Universität Gießen; [2]Psychiatrie und Psychotherapie, Philipps-Universität Marburg; [3]Allgemeine und Vergleichende Sprachwissenschaft, Johannes Gutenberg-Universität Mainz
jutta.billino@psychol.uni-giessen.de

Communication is challenged with increasing age due to sensory loss and decline of cognitive resources, e.g. attention and working memory. Gestures play a crucial role in maintaining communication. They help speakers to express their thoughts and also facilitate understanding of spoken language. Thus, gestures could provide a compensatory mechanism during ageing. However, age-related changes in gesture use in communication situations are largely unexplored. We aimed to investigate individual differences in gesture use across the adult lifespan and putative links to cognitive capacities. We applied a recently introduced gesture scale that assesses self-reported gesture production and perception in everyday communication situations to a sample of 204 participants ranging in age from 20 to 83 years. In addition, we characterized all participants comprehensively with regard to their cognitive capacities. We found a significant negative correlation between age and total scores in the gesture scale ($r=-.23$, $p<.01$). Increasing age was associated with a reduced use of gestures. Regression models showed that variation in gesture use was not explained by individual cognitive resources. Our results question a compensatory role of gestures in communication in old age. They indicate specialized functional mechanisms underlying gesture use that are prone to age-related decline.

Post-warnings can undo stereotype-induced memory distortion

Hartmut Blank, Lauren Rutter & Rebecca Armstrong
University of Portsmouth
hartmut.blank@port.ac.uk

Research demonstrating memory distortion is abundant, but its temporal stability is hardly explored (pointing to a default assumption that, once distorted, a memory will remain distorted). Extending demonstrations that the eyewitness misinformation effect can be undone after a post-warning about the presence of misinformation (Oeberst & Blank, 2012), the present research found that stereotype influence on memory can be similarly undone. Participants remembered details of self-descriptions of two persons who were labelled as a vicar or builder, leading to stereotype-consistent memory distortions in an initial multiple-choice recognition test (compared to a no-label condition). A week later, a post-warning that we had made up these labels eliminated the stereotype effect and restored memory for the correct details. We discuss theoretical implications.

Identification of Linear, Exponential, and Step Function Trends in Scatterplots: Detecting Straight Lines Straightforward

Christine Blech & Robert Gaschler
FernUniversität in Hagen, Department of General Psychologie (Learning, Motivation, Emotion)
christine.blech@fernuni-hagen.de

Scatterplots have a high impact in communicating scientific results. While in natural sciences "graphism" is considered as the gold standard, psychologists often doubt the credibility of graphical representations and favor the apparent exactness of p-value statistics. For the present study three curve shapes (linear, exponential, step) combined with two trends (rising, falling) were transferred into scatterplots by adding random noise of four different intensity degrees to the y-axis values. An online experiment (N = 237) demonstrated that in a forced choice format plots with higher noise intensity were misclassified more often along with lower subjective confidence. The hypothesis that linear trends in scatterplots are detected more easily than other shapes was confirmed for the pairwise comparison between linear and step function plots. Regarding linear vs. exponential function plots the hypothesis was confirmed for confidence ratings, but not for the actual identification performance. The results suggest that possibly based on familiarity and expectation there is a linearity bias in the perception of scatterplots and a tendency to neglect the presence of step functions. Future recommendations include investigating the effect of context information on this bias in order to use the full potential of graphical representation of data in science.

Perceived Ownership Influences Perspective Taking Towards Avatars

Christian Böffel & Jochen Müsseler
RWTH Aachen University, Institute of Psychology
boeffel@psych.rwth-aachen.de

Avatars are artificial representatives of actors in a virtual world. When interacting with avatars in computer applications, we can identify two types of avatars: Avatars that are controlled by the actor, and avatars that are controlled by others. Visual perspective taking is a valuable tool to plan our actions through the avatar or to understand the actions of avatars controlled by others. This study used the concept of stimulus-response compatibility to examine the influence of perceived ownership on visual perspective taking. Participants were confronted with an avatar that was sitting opposite to them. Key presses caused movements of the corresponding avatar hand. Two groups of participants were given different instructions of the same experimental sequence. A high ownership instruction underlined the participants control over the avatar, a low ownership instruction established the avatar as an independent agent. An ownership questionnaire revealed higher levels of perceived ownership in the high ownership group. The high ownership group showed a benefit of spatially non-corresponding stimulus-response sets that indicated visual perspective taking. This effect was absent in the low-ownership condition. These results support the idea that higher perceived ownership benefits visual perspective taking.

Nighttime sleep benefits prospective memory by improving its prospective component

Mateja F. Böhm[1], Ute J. Bayen[1] & Reinhard Pietrowsky[2]
[1]Heinrich-Heine-Universität Düsseldorf, Department of Mathematical and Cognitive Psychology; [2]Heinrich-Heine-Universität Düsseldorf, Department of Clinical Psychology
mateja.boehm@hhu.de

Remembering to carry out intentions at the appropriate time requires prospective memory (PM). PM consists of a prospective component (remembering that something needs to be done) and a retrospective component (remembering what and when it needs to be done). Nighttime sleep benefits PM (Scullin & McDaniel, 2010). Here, we investigated whether this benefit is due to the prospective and/or the retrospective component. To disentangle the components, we used the multinomial model of event-based PM (Smith & Bayen, 2004). Sixty-two participants formed an intention in the morning or in the evening and stayed awake during the day or slept at night, respectively. Twelve hours after intention formation, each group performed a standard event-based PM test. To control for time-of-day effects, participants also performed a PM test during their first session. After the retention interval, the sleep group showed a stronger prospective component than the wake group. Moreover, in the wake group, the prospective component showed a steeper decline from the first to the second session. There were no time-of-day effects in the prospective component. Hence, this component benefitted from sleep. The retrospective component did not benefit from sleep. Implications for theories of sleep and PM will be discussed.

Law Students' Judgments of a Rape Victim's Statement: The Role of Displays of Emotion and Acceptance of Sexual Aggression Myths

Gerd Bohner & Evelyn Schapansky
Universität Bielefeld, Department of Psychology
gerd.bohner@uni-bielefeld.de

Research has shown that victims of rape who display appropriate emotions (versus inappropriate or no emotions) may be judged to be more credible. The authors studied the interplay of a victim's emotion displays with perceivers' acceptance of modern myths about sexual aggression (AMMSA) in predicting judgments of credibility and blame. Law students (N = 120) completed an AMMSA scale and watched a videotape of a rape victim (an actress) during a simulated interview. The emotion displayed by the victim (sad, angry, or neutral) was experimentally manipulated; her statement's verbal content was held constant. Dependent variables (DVs) were perceived credibility, victim blame, and severity of the case. Results showed that AMMSA strongly predicted all DVs across conditions. Effects of the displayed emotions were less pervasive and depended on participants' gender and AMMSA: For example, only women high in AMMSA (but not women low in AMMSA or men) judged the sad victim's statement to be most credible and the angry victim's statement to be least credible, with the neutral statement falling in between. The findings suggest that perceivers may be better able to avoid unwanted external influences (the emotional displays) than unwanted internal influences (their own AMMSA).

Morphosyntactic processing in a masked priming paradigm

Johannes Bommes[1], Ulrich Ansorge[2] & Maximilian Stein[3]
[1]Georg August University Goettingen; [2]University of Vienna, Faculty of Psychology; [3]Georg August University Goettingen, Department of Experimental Psychology
johannes.bommes@stud.uni-goettingen.de

We used a masked priming paradigm to examine morphosyntactic processing of written German relative clauses in a syntactic decision task. After presenting a noun, the relative clause was introduced by a relative pronoun that was followed by a personal pronoun and a verb (e.g., Die Jacke, die mir passt). The sentences were either syntactically correct or incorrect based on a variation of the morphosyntactic form of the personal pronoun (prime) and the verb (target). The syntactic violations concerned the agreement of case (prime - target mismatch), of number (noun - target mismatch), or of both. Forty percent of the primes were masked by a random sequence of five numerals, displayed after the offset of the prime. In masked trials, we found a significant prime-target congruency effect on reaction time. This effect was only found in syntax-correct judgments of noun-verb congruent sentences but not in syntax-incorrect judgments of noun-verb incongruent sentences. Visibility of masked primes was measured indirectly yielding a mean sensitivity exceeding zero (d' = 0.23). However, a linear regression suggested no association existed between congruency effect and prime visibility.

The impact of shared mental models on team performance in a fault diagnosis task

Rica Bönsel[1], Luise Schegner[2], Sebastian Heinze[2], Leon Urbas[2] & Romy Müller[1]
[1]TU Dresden, Professur Ingenieurpsychologie und angewandte Kognitionsforschung; [2]TU Dresden, Professur Prozessleittechnik
rica.boensel@tu-dresden.de

In the process industries, control room operators and a field operators have to closely work together to diagnose faults in the plant. There is a high risk of problems as the partners are physically separated, have access to different types of information, and must rely on verbal communication. Shared mental models are considered to facilitate team interaction, but previous research has only collected information on the similarity of mental models post-hoc. The present study directly manipulated the similarity of team members' task models and team models by varying the amount of knowledge participants received during an instruction phase. Three groups of ten participants had to jointly diagnose five technical faults in a simulated plant, and either shared a task model, a team model, or models of both team and task. Performance and communication data was evaluated. Teams who only shared a team model violated work safety rules more often than teams that shared both models. Other performance measures (e.g., time on task, number of correct diagnoses) did not differ between groups. These findings suggest that it can be beneficial to train all team members on the complete team task instead of teaching them only their own responsibilities.

Replication and Validation of an experimental paradigm of measuring open-earedness

Isabell Bötsch[1] & Richard von Georgi[2]
[1]University of Technology Braunschweig; [2]SHR Hochschule der populären Künste
i.boetsch@tu-bs.de

Open-earedness is often defined or operationalized by valence for specific music stimuli. Many of these valence oriented approaches can be criticized for a lack in theoretical framework and methodological problems. Referring to openness to experience and related traits the so called decision making paradigm defines open-earedness as an open behavior to music which could be measured by the variation in self-chosen music categories (von Georgi & Frieler, 2014). Aim of this study is the replication and validation of the decision making paradigm. The sample consists of 242 subjects (51.3 % females) with a mean age of 30.87 (SD=17.94; min=12; max=83). All subjects were asked to choose a piece of music considering their own individual preferences and interests out of a pool of music-categories (genres) and to rate their valence. After 15 times of decision-making and listening the subjects conducted the NEO-FFI and the Sensations Seeking Scale V as well as some questions about demographics and music preferences. Openness to Experience and Experience Seeking (depending on age) seems to predict the variation in decisions for music categories and therefore an open behavior toward music by a medium effect. Open-earedness also seems to be independent of age.

Contingency Learning and Choice-Behavior Based on Self-Directed and Other-Directed Information Sampling

Franziska Bott & Thorsten Meiser
University of Mannheim, Department of Psychology
f.bott@uni-mannheim.de

In order to properly determine contingencies, one needs to use joint frequencies of the involved variables. Yet, studies on contingency learning show that this co-occurrence-information is not readily considered by participants, resulting in possibly distorted contingency judgments such as pseudocontingencies that are based on base rates (Fiedler, Freytag, & Meiser, 2009). In these studies, participants are usually exposed to predetermined learning trials in which all variables are presented. However, in more natural situations, this is rarely the case. In two experiments, we investigated to what extent the information observed after a series of learning trials differs when information sampling was self-directed versus other-directed and whether this results in different contingency judgments. We manipulated whether information regarding contexts, options, and outcomes was sampled by the participant or predetermined by the experimenter. The results show that participants preferred the context and the option with the higher reward. Estimates of the contexts' winning probabilities also reflected the true contingency with the outcomes. Likewise, the preference for the context with the higher reward was already apparent in the sampling behavior. Experiment 2 constitutes an extension in which the salience of context-dependent base rates as a potential moderator was additionally manipulated.

Context-specific instruction implementation

Senne Braem
Ghent University
senne.braem@ugent.be

It is a uniquely human ability to quickly use and implement verbal instructions to (re)configure new task sets. It can be argued that the processes implicated in implementing new task instructions can be placed at the top of the hierarchy of cognitive control. In doing so, some might be tempted to ascribe these processes to an independent, domain-general, supervisory executive system responsible for correcting and (re)configuring task sets. However, a learning perspective on cognitive control suggests that all control processes are not independent, but, instead, are embedded in more low-level forms of learning and thus sensitive to contextual triggering. This study investigated whether the rapid implementation of novel task instructions becomes more efficient in contexts associated with more novel task instructions than contexts where most task instructions are repeated. Across two experiments, we demonstrate that new instructions were implemented better when they were presented on a task-irrelevant screen location or font color that was predictive of instructions that were more likely to be novel. Together, these findings suggest that the implementation of new task instructions is a process that can be called upon by the context, possibly providing a self-regulating mechanism for cognitive control processes like instruction implementation.

Introspection about RTs in cued task switching

Daniel Bratzke & Donna Bryce
Universität Tübingen, Fachbereich Psychologie
daniel.bratzke@uni-tuebingen.de

The present study explored introspection about one's own RT performance in cued task switching. In two experiments, we independently varied the response-cue interval (RCI) and the cue-target interval (CTI). Each experimental trial consisted of a sequence of two tasks (non-switch or switch), and at the end of the trial participants provided introspective estimates of their response times for the two tasks (IRT1 and IRT2) on visual analogue scales. In Experiment 2, participants additionally provided estimates of the RCI and the CTI for the second task. In Experiment 1, both lengthening the RCI and lengthening the CTI resulted in a reduction of objective switch costs in RT. Subjectively, however, only lengthening of the RCI reduced switch costs. In Experiment 2, only lengthening the CTI reduced the switch costs in objective RTs, and this pattern was rather accurately reflected in IRTs. However, participants indicated longer IRTs for the longer RCI even though there was no such effect in objective RTs. The present results confirm our previous finding that participants are aware of their switch costs, and suggest that timing of the preparatory intervals (CTI and RCI) can alter objective task switching performance as well as its subjective experience.

Sensorimotor learning and decision-making in uncertain environments

Daniel Braun
Institute of Neural Information Processing, Ulm University
daniel.braun@uni-ulm.de

Recent advances in movement neuroscience suggest that sensorimotor control can be considered as a continuous decision-making process in complex environments in which uncertainty and task variability play a key role. Leading theories of motor control assume that the motor system learns probabilistic models and that motor behavior can be explained as the optimization of payoff or cost criteria under the expectation of these models. Here we discuss how the motor system exploits task variability to build up efficient models through structural learning and compare human behavior to Bayes optimal models. In particular, we focus on deviations from these normative models due to effects of model uncertainty and we discuss in how far model uncertainty can be considered as a special case of a general decision-making framework that considers limited information-processing capabilities.

Studie zu Warnwirkung und Akzeptanz von haptischem Feedback am Gaspedal im Kontext von Fahrerassistenzsystemen

Martin Brockmann[1] & Pia Weber[2]
[1]Allround Team GmbH Automotive HMI Development; [2]Allround Team GmbH, Automotive HMI Development
martin.brockmann@allround-team.com

Aus der Literatur ist bekannt, dass über den haptischen Sinneskanal übermittelte Informationen Reaktionszeiten und Fahrleistungen signifikant verbessern können. Daher könnte auch die Anwendung des haptischen Feedbacks am Gaspedal im Kontext von Fahrerassistenzsystemen vielversprechende Resultate liefern. In dieser Studie wurde die Warnwirkung einer haptischen Pedalrückmeldung auf das Fahrerverhalten in kritischen Fahrsituationen untersucht. In einem statischen Simulator der Ford Werke Köln durchfuhren insgesamt N=53 Versuchspersonen ein Curve Speed Warning (CSW) Szenario sowie verschiedene alternative Warnszenarien. Dabei wurde Fehlerrate, Bremsreaktionszeit, Kritikalität und Nutzerakzeptanz gemessen. In Experiment 1 (N=29) wurde die Art des haptischen Pedal-Feedbacks, Vibration, Counterforce oder Double-Tick, variiert. Ergebnis: Die Double-Tick Variante schloss bei der Fahrerreaktion deutlich schlechter ab. Hinsichtlich Akzeptanz wurde Counterforce und Double-Tick positiver bewertet als Vibration. Allerdings ist die Präferenz abhängig vom Warnszenario: Für die Alternativ-Szenarien Forward Collision Warning und Speed Limit Warning wurden jeweils unterschiedliche Arten des haptischen Feedbacks favorisiert. Bezüglich der Kritikalität haptischer Pedal-Feedbacks konnte gezeigt werden, dass die überraschende Auslösung einer Fehlwarnung als weitgehend unkritisch für die Kontrollierbarkeit der Fahrsituation eingestuft wird. In Experiment 2 (N=24) wurde haptische Pedalrückmeldung mit visuell-akustischer Rückmeldung kombiniert. Es zeigte sich, dass das Hinzufügen visueller und akustischer Stimuli die Gesamtbremsreaktionszeit signifikant verringerte. Die Art des Haptik-Signals machte hierbei keinen Unterschied.

Integration of multiple intrinsic and extrinsic cues in metamemory judgments

Arndt Bröder, Monika Undorf & Anke Söllner
University of Mannheim, School of Social Sciences
broeder@uni-mannheim.de

Metacognition (cognition about cognition) is an important faculty of the human mind enabling the monitoring and regulation of cognitive activities. The metacognition researcher's workhorse are people's judgements about their cognitive processes and functions, for example judgements of learning (JOLs). Here, people judge the probability with which they will later be able to retrieve an item in a memory test. JOLs are probably inferences based on diverse metacognitive cues, but typical experiments vary only one cue at a time. This opens the door for serious demand effects, and leaves open the question whether people are able to integrate several cues varying simultaneously. In four experiments varying both intrinsic (word properties) and extrinsic (studying circumstances) cues simultaneously, we explored people's ability to integrate cue information in metacognitive judgements, demonstrating a remarkable ability of cue integration in metamemory judgments.

Predictability as a task-specific performance enhancer in multitasking

Laura Broeker
German Sport University Cologne, Institute of Psychology - Department of Performance Psychology
l.broeker@dshs-koeln.de

Research suggests a beneficial impact of predictability on dual-task cost reduction, e.g. through perceptual cues or anticipation. We conducted five experiments in which we applied a continuous tracking paradigm together with a discrete auditory reaction-time task and manipulated predictability in the first, the second, or both tasks. In the first two experiments, participants received advance visual information about the tracking path, enabling them to predict the target's path; in the third and fourth experiments, sounds were structured according to a predefined sequence, enabling participants to predict the onset of target sounds; and in the fifth experiment, sounds were located 250 ms before the inflection point of the tracking curve, enabling participants to use sounds as warning signals for tracking activity and to integrate the two tasks into one meaningful, covarying task. Results suggest that predictability operates as a task-specific performance enhancer in dual tasks, in that visual predictability predominantly aided tracking, auditory predictability predominantly aided reaction times, and only task-integration manipulations improved performance in both tasks. We suggest that one-sided information may either be insufficient to free enough resources to cope with dual-task requirements or may fool participants into believing the perceptual information emphasizes the importance of the task.

Modes of task processing: Converging evidence of an individual preference in free concurrent multitasking across different tasks, instructions, and time structures

Jovita Brüning, Jessika Reissland & Dietrich Manzey
Technische Universität Berlin, Department of Psychology and Ergonomics
jovita.bruening@tu-berlin.de

In free concurrent multitasking, processing of two tasks can be addressed on a behavioral level of response organization or on a level of internal task processing mechanisms. This presentation focusses on the modes of task processing. Reissland & Manzey (2016) and Brüning & Manzey (2017) proposed an approach to examine the individual mode of task processing classifying their participants as serial or overlapping processors. We now present converging evidence from six studies using different tasks (simple verbal letter/digit classifications, spatial mental rotation/pattern matching tasks, memory tasks, and calculation tasks), different instructions (neutral or emphasizing overlapping processing), and different time structures (similar/different baseline reaction times, different response-stimulus intervals). The preferred mode of task processing was identified based on a fine-grained analysis of the time structure of the responses for most participants. The reported studies show that overlapping processors can at least partially compensate for switch costs and some are even more efficient when multitasking than monotasking. This emphasizes the relevance of the preferred mode of task processing when describing human behavior in multitasking. However, the proportion of serial and overlapping processors varied between the studies with different characteristics showing that the processing mode does not purely depend on the individual preference.

TVA-based assessment of visual processing capacity in patients with idiopathic REM sleep behaviour disorder

Peter Bublak
Jena University Hospital, Hans Berger Department of Neurology
peter.bublak@med.uni-jena.de

Rapid Eye Movement (REM) sleep Behaviour Disorder (RBD) is characterized by loss of REM sleep muscle atonia and dream enacting behavior. It is assumed to reflect early involvement of REM-sleep regulating brainstem areas in synuclein-mediated neurodegenerative processes (e.g. Parkinson's disease (PD) dementia or dementia with Lewy bodies). According to the neuroanatomical hypothesis of ascending neurodegeneration in synucleinopathies, rostral brain areas including the cortex would be affected not until later disease stages. More than 80% of patients with idiopathic RBD (iRBD) develop major motor symptoms or dementia. Therefore, RBD represents an ideal precursor model to test this hypothesis by looking for prodromal neuro-cognitive changes, in particular visuo-cognitive deficits. Impaired visuo-cognitive functions have been identified to be especially pronounced in synucleinopathies. Thus, in the present study, we investigated whether changes in visual processing capacity are present in a sample of RBD patients, and related to visuo-cognitive functions like incomplete object identification. The results obtained are identical to earlier findings in patients with amnestic MCI and early Alzheimer's disease, suggesting that posterior cortical neurodegeneration does already exist in patients with iRBD.

Judging the mood of the crowd: Attention is focused on happy faces

Alica Bucher & Andreas Voss
Heidelberg University
alica.bucher@psychologie.uni-heidelberg.de

Previous research on valence biases in face perception revealed inconsistent findings either proposing angry or happy faces to be detected more efficiently. We argue that the typical experimental task in this field, the face-in-the-crowd paradigm, lacks ecological validity and leads to ambiguous results. In the present paper, we introduce the mood-of-the-crowd paradigm, that can complement existing findings. In the new task, participants have to decide which expression is shown by most faces in a crowd. In Experiment 1, photographs were used as stimuli, whereas computer-generated faces were presented in Experiments 2 and 3. While in the Experiments 1 and 2 crowds consisted of faces showing either happy and neutral expressions or angry and neutral expressions, in Experiment 3, crowds were composed of both angry and happy faces. Attentional processes were assessed with gaze recordings. Across experiments, results indicate that happy faces are focused with higher probability, and that the predominance of happy faces is assessed more accurately compared to the predominance of angry faces. Moreover, gender of presented faces was found to be an important moderator: There was a clear bias to classify female crowds as emotional. Additionally, the emotionality of female crowds was assessed more accurately.

Testing enhances subsequent learning of spatial information in younger and older adults

Jonathan Bufe & Alp Aslan
Martin Luther University Halle-Wittenberg, Department of Psychology
alp.aslan@psych.uni-halle.de

Prior research has shown that testing can enhance subsequent learning by reducing interference from the tested information. Here, we investigated this forward effect of testing in younger and older adults' memory for spatial information. Participants studied four successively presented 3x3 arrays, each composed of the same 9 objects. They were asked to memorize the locations of the objects which differed across the four arrays. Following presentation of each of the first three arrays, memory for the object locations of the respective array was tested, or the array was re-presented for additional study. Results revealed that, compared to additional study, immediate testing of the first three arrays improved location memory on the subsequently studied fourth array, both in younger and older adults. In addition, immediate testing of the first three arrays also reduced the number of confusion errors (i.e., assigning an object to a location on which it had been presented previously) made during recall of the fourth array, again in both age groups. The current results extend previous findings by indicating that, in both younger and older adults, testing enhances subsequent learning of spatial information by reducing the build-up of proactive interference from previously studied information.

A Meta-Analysis of Contingent-Capture Effects

Christian Büsel, Ulrich Ansorge & Martin Voracek
Universität Wien, Institut für Psychologische Grundlagenforschung und Forschungsmethoden
christian.buesel@univie.ac.at

The present meta-analyses investigated the contingent-capture protocol. The contingent-capture theory postulates that only top-down matching stimuli capture attention. Evidence for this assumption comes from the contingent-capture protocol, in which participants search a predefined target stimulus preceded by a spatial cue. The cue is typically uninformative of the target's position but either presented at target position (valid) or away from the target (invalid). The common finding is that seemingly only top-down matching cues capture attention, as demonstrated by a selective cueing effect only for cues with a feature similar to the searched-for target. However, the origin of this "contingent-capture effect" is debated. One explanation is that intertrial priming mediates the contingent-capture effect. Alternatively, the rapid-disengagement account proposes that all salient stimuli capture attention initially, but that the disengagement from non-matching cues is rapid. The present meta-analyses shed light on this debate by (a) identifying moderators of reported contingent-capture effects (60 experiments) and (b) summarizing results of published intertrial priming studies (12 experiments) in the contingent-capture protocol. We found target-display heterogeneity to be a reliable moderator, as well as a considerable amount of between-study heterogeneity. Furthermore, results indicated the presence of publication bias in the published literature.

Eye-movement behavior during object search and scene memorization with spatial-frequency filtering in central or peripheral vision

Anke Cajar, Ralf Engbert & Jochen Laubrock
University of Potsdam, Department of Psychology
cajar@uni-potsdam.de

When viewing a scene, we move our eyes several times per second to bring objects of interest from the low-resolution periphery into the high-acuity fovea. The foveal visual field is specialized in processing fine detail (high spatial frequencies) for object recognition and the peripheral visual field is specialized in processing coarse information (low spatial frequencies) for saccade target selection. Here we investigated how this functional segregation affects eye-movement behavior during scene memorization and object search in color and grayscale scenes. Using eye tracking, high or low spatial-frequency filters were applied gaze-contingently to central or peripheral vision. Preliminary results indicate similar eye-movement behavior with memorization and search in color and grayscale scenes: Viewers avoided filtered scene regions as saccade targets, and fixation durations increased most with central high-pass and peripheral low-pass filtering. The latter suggests that viewers invested more processing time when critical spatial frequencies were still available. For both color and grayscale scenes search was faster and more accurate with central high-pass than low-pass filtering; peripheral filters had similar effects on search performance. We conclude that object search and scene memorization are more efficient when critical spatial frequencies for foveal analysis and peripheral selection are still largely available.

A SUBJECT ORIENTED STATE-SPACE APPROACH TO MODEL MOUSE TRACKING-DATA

Antonio Calcagnì[1], Luigi Lombardi[1], Marco D'Alessandro[1], & Simone Sulpizio[2]
[1]University of Trento, Department of Psychology and Cognitive Science; [2]Vita-Salute S. Raffaele University, Faculty of Psychology
ant.calcagni@gmail.com

Over the last decades, mouse-tracking based experiments are becoming popular and widespread. Mouse-tracking is a technique to record time-based x-y computer mouse positions during experimental tasks (e.g., categorization). To analyze mouse-tracking data, several approaches have been proposed, both from model-free and model based methodologies. In this contribution we propose a new way to analyze mouse-tracking data within a state-space model perspective. Particularly, the instantaneous decision positioning of the mouse is modeled as a function of both a subject-specific response model and a trial-specific complexity model. The overall model is then estimated simultaneously using a tailor-made Metropolis Hastings algorithm. Real data from lexical decision tasks are finally used to show the potentials of the proposed method.

Directly Comparing the Effects of Reward Prospect and Reward Reception on Conflict Adaptation

Rebecca Calcott & Gesine Dreisbach
University of Regensburg, Psychology
rdcalcott@gmail.com

Conflict adaptation occurs via top-down processes as well as simple learned associations, and is altered by performance-contingent rewards. Prior work has manipulated either reward prospect or reward reception; however they have never been directly contrasted, thus it is unclear which aspects of conflict adaptation are modulated by reward prospect and reception respectively. The goal of this exploratory study is to explicitly test the distinction between reward prospect and reception, by determining their effects on top-down versus association-based conflict adaptation. Participants (Target N=105) complete a rewarded Simon Task. In the Prospect condition, participants are informed about the opportunity to earn a reward prior to each trial, but receive no post-trial feedback. In the Reception condition, participants receive no information prior to the trial, but receive feedback after each rewarded trial. Participants' use of a pre-cue indicating proportion congruence indicates the strength of top-down processes, while their reactive adaptation to the previous trial (congruency sequence effect) indicates association-based processes. Results will delineate the aspects of reward that modulate different mechanisms of conflict adaptation, aid in interpreting prior research, and have important implications for the design of future experiments involving performance-contingent rewards.

Auditory contributions to visual anticipation in tennis

Rouwen Cañal-Bruland[1], Florian Müller[1], Björn Lach[1] & Charles Spence[2]
[1]Friedrich Schiller University Jena, Department of Sport Psychology; [2]University of Oxford, Department of Experimental Psychology
rouwen.canal.bruland@uni-jena.de

Due to the time constraints, in sports such as tennis visual information pick-up is key to successful anticipation. Yet, the contribution of auditory cues to anticipatory judgements in such situations has received little attention thus far. In the current study, we scrutinized whether the sound of a tennis ball being struck by a racquet would modulate anticipatory judgments of its trajectory. Tennis players were invited to watch videos of tennis rallies from the semi-final of the Australian Open 2016 between Djokovic and Federer, and to predict where the ball would land in the opponent's half. The loudness of the sounds emanating from the racquet at ball contact were systematically manipulated. The results showed that the louder the sound of the contact between the racquet and ball, the longer participants estimated the ball's trajectory to be. Our findings suggest that besides the contribution of vision to anticipation, action-related auditory cues seem to influence anticipatory judgements of the outcome of strokes in tennis as well.

Role of the cerebellum in adaptation to delayed action effects

Liyu Cao
University of Würzburg, Department of Psychology
liyu.cao@uni-wuerzburg.de

Predicting the timing of self-generated stimuli is important for efficient information processing. Self-generated stimuli elicit smaller neural responses as compared to the same stimuli that are externally generated, which is known as sensory attenuation effect. People get adapted to delayed stimuli resulting from self-action by showing an increased sensory attenuation effect, which indicates an update of timing prediction for self-generated stimuli. Both theoretical and empirical studies assert that the cerebellum is important for predicting self-generated stimuli and for the prediction updating. In this TMS-MEG study, we tested the role of the cerebellum in updating the timing prediction for self-generated stimuli by introducing a 100 ms delay between a keypress and tone presentation. We showed that participants get adapted to delayed action-effects by showing an increased sensory attenuation effect (M100 component) within 300 trials. However, this increase in sensory attenuation disappeared after a 15-minute right cerebellar stimulation using an inhibitory 1 Hz repetitive stimulation protocol. There was an amplitude change for evoked components in a late time window (M200 component) after cerebellar stimulation, which we interpreted as a result of changes in the neural information routing in the brain hierarchy following the cerebellar stimulation.

Number of users as a heuristic for making decision: advice-taking in social media

Guillermo Carbonell[1], Matthias Brand[1] & Dar Meshi[2]
[1]University of Duisburg-Essen, General Psychology: Cognition; [2]Michigan State University, Social and Media Neuroscience Lab
guillermo.carbonell@uni-due.de

Physician rating websites allow users to check physicians' profiles, rate their performance, and find a suitable physician for visiting. The recommendation of other users might influence the decision of which physician to visit. In order to investigate this, we used a Judge-Advisor System where 130 participants (91 women, 38 men, age: M= 25.72, SD= 9.79 years) reported the likelihood to visit a physician at two different times: before and after seeing the recommendation of others. Three conditions were presented: high and low number of users recommending a physician, and no recommendations. We also assessed decision-making under objective risk conditions, executive functions, and personality. We found that participants were more confident and also adapted their second estimate closer to the recommendation when a high number of users were rating the physician. We are able to find analogies between advice-taking as classically studied in cognitive psychology and user-behavior on the internet. A high number of users rating might be a heuristic that influences the decision, similar to the role of expertise which has been shown in other studies. Future studies should investigate the neural correlates of following recommendations, which can be compared to advice-taking.

Eye movement patterns in reading texts with unusual typography

Johan Chandra, André Krügel & Ralf Engbert
Universität Potsdam, Experimental & Biological Psychology
jochandr@uni-potsdam.de

The interplay between cognitive and oculomotor processes in word selection and saccade generation can be explored when the spatial information of text deviates from the normal display of text. While cognitive aspect of eye guidance (fixation durations, fixation probabilities) are highly adaptive, the properties of the oculomotor system turned out to be rather stable. We trained readers in reading manipulated texts and investigated various eye-movement measures during reading of text with manipulated typographic display compared to normal text: Word-wise and letter-wise mirror-reversed, inverted, and scrambled conditions. As expected, longer fixation times, shorter saccades lengths, less word skippings and more refixations and regressions were observed in reading manipulated text compared to reading normal text. However, we also found adaptivity of the oculomotor system. While reading text with inverted writing direction reduced the launch-site effect, reading manipulated text with typical writing direction increased the launch-site effect. In two-fixation cases, we could also find evidence for shifts in mean landing positions towards the most informative part of the text strings. These results support the view that oculomotor system is adaptive when confronted with unusual reading conditions.

Observation of the whole-body movement sequences: Memory encoding, retention, and retrieval of the movement-related spatial and temporal information

Shiau-Chuen Chiou & Thomas Schack
Bielefeld University, Neurocognition and Action Research Group, Center of Excellence Cognitive Interaction Technology (CITEC)
shiau-chuen.chiou@uni-bielefeld.de

What kind of information do we perceive and retain during action observation? In this study, we aimed for understanding how well the spatial (trajectory) and the temporal (rhythm) information of whole-body movement sequences can be encoded, retained, and retrieved from the short-term memory. Participants (n = 28) watched two sequentially displayed movement clips (6 s each) with an ISI of 0.5 s or 3 s and then made a same-different judgment. Movement sequences, all without action semantics, were different in either spatial and/or temporal domain. The results showed that the change of the temporal information was less detectable than that of the spatial information as measured by perceptual sensitivity (d'), indicating a weaker memory trace on temporal information. Surprisingly, no significant difference was found between the short and the long ISIs. Two possible explanations would be: First, there is an encoding rather than a retention problem; or second, the encoding process may be intact, but the memory trace of the temporal information has already decayed during the display of the first video, and the preserved information, which is likely to be the abstracted information of a movement, retained longer than 3 s in the memory system.

Prioritization across distributed neural stores for visual working memory

Thomas B. Christophel, Polina Iamshchinina, Chang Yan, Carsten Allefeld & John-Dylan Haynes
BCCN Berlin
tbchristophel@gmail.com

Visual working memories are represented by a widespread network of neural stores, ranging from detailed representations in visual cortices to robust and invariant storage in prefrontal cortices. It is unclear, however, what principles govern whether a given area is recruited for working memory storage. Here, we show that attentional prioritization can govern what areas represent individual working memory items. In a two-stage change discrimination task, participants memorized the orientation of two gratings in each trial. A first cue indicated that one of them (the attended item) should be used for a first orientation-change-discrimination task after a delay. Then, a second cue could select either the same or the other, previously unattended item for a second task. Such a two-stage task forces participants to maintain the orientations of both gratings until the presentation of second cue, but directs attention to the cued item. We used fMRI and multivariate pattern analyses (cvMANOVA MVPA) to examine the distinctness of brain activity patterns evoked by working memory storage. Anterior regions (IPS and FEF) carried information about both attended and unattended items. Visual areas (V1-V4), however, selectively carried information about attended items, demonstrating that attentional prioritization can govern the localization of working memory storage.

The "distraction potential" of environment sounds during closed-loop visuomotor control

Lewis Chuang & Menja Scheer
Max Planck Institute for Biological Cybernetics
lewis.chuang@tuebingen.mpg.de

Sounds in our environment can capture our interest even if they bear no relevance to our ongoing occupation. In the context of driving, this could be a crying child in the backseat. Even if we do not exhibit any behavioral responses, our brains generate a characteristic ERP waveform to such sounds; this has been termed the distraction potential (Escera & Corral, 2003). We have found that general steering demands attenuate the amplitudes of the early and late novelty P3 components of this distraction potential (Scheer, Bülthoff, Chuang, 2016). In particular, varying the complexity of a steering task's control dynamics selectively attenuates the late novelty P3 component of the distraction potential, whilst having no effect on the early novelty P3. Other manipulations of steering difficulty, such as control disturbances, do not have a similar impact. These findings mirror those found in dual-task paradigms whereby similar conflicts were found with the P300 potentials generated by infrequent task-relevant tones (e.g., Wickens et al., 1983). Thus, we propose that the late novelty P3 component generated by complex and task-irrelevant sounds is comparable to the better established P300 potentials. Both components might reflect the availability of cross-modal executive working memory resources.

The effect of perceptual set in airport security

Anna Conci
FernUniversität in Hagen
anna.conci@fernuni-hagen.de

Visual search is of great importance in some jobs, such as luggage screening at airports. To guarantee a safe flight, the screening operator needs to notice dangerous objects (targets) in luggage. Previous studies have found that one of the biggest problems in visual search is the phenomenon of subsequent search misses (SSM): people often cannot find a second target when they have already found one. One explanation for missing the second target is the perceptual set hypothesis. It predicts that when a target has been found, people are more likely to find a second target when it is similar to the first one. SSM frequently occurs in the standard laboratory visual search with multiple targets. We tested it using x-ray images of hand packages. Participants either had to keep the target or a different figure in working memory while searching the display. With the target in working memory, search times were lower and accuracy was higher. Therefore, we can assume that visual search performance is depending on the perceptual set.

Task demands bias structural representations in visual working memory: Global- and local-level hierarchical object benefits

Markus Conci, Heinrich René Liesefeld, Hermann J. Müller & Qi-Yang Nie
Ludwig-Maximilians-Universität München, Department Psychologie
conci@psy.lmu.de

Natural scenes consist of multiple hierarchical levels, though typically more global levels are prioritized over more local levels. A global-object benefit has also been revealed in visual working memory (vWM), which illustrates that mnemonic representations of global objects are prioritized over corresponding local object levels (Nie, Müller & Conci, 2017). This finding supports a hierarchical organization of items in vWM, but it is unknown whether such structured representations can be adapted flexibly according to task demands. To test the flexibility of object structure in vWM, we performed two experiments that presented to-be-remembered hierarchical configurations with global and local orientation information in change-detection (Experiment 1) and continuous-report (Experiment 2) tasks while systematically varying the amount of required memory precision. Our results revealed a consistent influence of precision demands on the structure of memory: the typical global-object benefit was reduced and eventually reversed into a local-object benefit with the degree to which object details were to be remembered. These findings indicate that structured memory representations are flexibly adjusted according to task demands, thus challenging accounts that assume fixed representations in vWM.

Explicit and implicit modality switching in a naming task

Carla Contreras Saavedra, Andrea Philipp & Iring Koch
RWTH Aachen University, Department of Cognitive and Experimental Psychology
carla.contreras@rwth-aachen.de

This research explores the interplay of explicit and implicit modality switching to learn more about potential influences on embodied language processing. The task is to name objects vocally. As regards explicit sensory modalities, the objects are either visually presented as pictures or auditorily presented as sound files. The objects differ with respect to their implicit sensory modality by being either audition-related (e.g., radio) or vision-related (e.g. camera). Both, the explicit and the implicit sensory modality vary in an unpredictable sequence. This enables us to analyze explicit modality switching and implicit modality switching as well as the influence of modality congruence (congruent = visual stimuli presented visually vs. incongruent = auditory stimuli presented visually). Preliminary results indicate a substantial switch cost with respect to explicit sensory modalities and a trend for implicit modality switch costs. This data pattern, however, is much stronger in incongruent trials than congruent trials. These findings indicate that the meaning of a word (i.e., the implicit sensory modality) plays a role in a naming task and interacts with the explicitly presented sensory modality. Also, demonstrate the primacy of explicit sensory modalities in language processing that might mask effects of embodied language processing.

Movement Primitives and Flexible Control in Virtual Reality

Annabell Coors, Benjamin Knopp & Dominik Endres
Philipps-Universität, AE theoretical neuroscience
Coorsa@students.uni-marburg.de

Research questions: Regularities in human movements are obvious, despite a large number of degrees of freedom in human bodies[1]. This led to the idea that the CNS generates movements by combining a small number of discrete elements, movement primitives (MPs)[2]. We tested which MP model describes corrective hand movements best. Besides, we examined whether the timing of a perturbation influences the motor control strategy. Furthermore, we evaluated the effect of time pressure on human movements and the suitability of virtual reality (VR) as a research method. Method: 30 participants performed a shelf-stacking task in VR while being full-body motion-captured. In half of the trials differently timed perturbations occurred that made corrective movements necessary. Results: The spatiotemporal model (5-8 MPs) accounts best for corrective hand movements. Average trajectories and timing provide strong evidence that open-loop control is used to correct for late perturbations while closed-loop control is employed in the case of early ones. Time pressure did not affect the success rate, but affected the mean velocity and the task evaluation. VR allows for high ecological validity and experimental control. References: [1] Bizzi, E. et al. (2008). Brain Research Reviews, *57*(1). [2] Franklin, D.W. & Wolpert, D.M. (2011). Neuron, *72*(3).

Psychopathic Meanness Predicts the Positive Expression, not the Acquisition, of Evaluative Responses in the Evaluative conditioning Paradigm

Olivier Corneille[1], Adrien Mierop[1], Catia Teixeira[2] & Pedro Almeida[3]
[1]Catholic University Louvain; [2]University of Groningen; [3]University of Porto
olivier.corneille@uclouvain.be

EC research has mainly focused on procedural conditions under which the pairing of stimuli results in the formation of evaluative responses. In contrast, the role of individual differences in EC has been largely neglected (e.g., De Houwer, 2009). This lack of interest is surprising, considering that individual differences have long been known to play a critical role in attitude formation (e.g., Brino~l & Petty, 2005). The present research examined the role of psychopathic traits in Evaluative Conditioning (EC) effects. Overall, evidence suggests that Psychopathy Meanness reduces the expression, rather than the acquisition, of evaluative responses in the EC paradigm, and that this effect is limited to the expression of positive responses for non-human stimuli. Mediating accounts in terms of reduced CS-US contingency awareness or lower sensitivity to US valence among higher meanness scorers are not supported by the data.

The acquisition of labels for auditory objects: An ERP study

Samuel H Cosper[1], Claudia Männel[2] & Jutta L Mueller[1]
[1]Osnabrück University, Institute of Cognitive Science; [2]Max Planck Institute for Human Cognitive and Brain Sciences; University Leipzig, Medical Faculty
samuel.cosper@uos.de

How infants learn words and acquire semantic meaning is the subject of philosophical debate and empirical study. Most studies investigating meaning acquisition choose a bimodal setup with spoken pseudowords to be associated as labels with visually presented images. In order to more fully understand the phenomenon of word learning, it is vital to explore modalities of objects beyond that of the visual – more specifically, the auditory. The current ERP study in 10- to 12-month-old infants used an association learning paradigm where novel auditory stimuli, namely environmental sounds, were paired with spoken pseudowords in either a constant or a random manner. In a subsequent testing phase, matching and non-matching auditory object-word combinations were presented. ERPs will be reported in relation to learning-related changes over time and to the processing of familiarized vs. non-familiarized pairings. The findings add insight to the current understanding of modality-specific constraints and processes during word learning in different stages of life. Moreover, further studies in this direction will additionally contribute to the debate between modality-specific and amodal semantic representations.

Switching between two modalities under fatigue

Árpád Csathó[1], András Matuz[1], Orsolya Simon[1] & István Hernádi[2]
[1]University of Pécs, Institute of Behavioral Sciences; [2]University of Pécs, Department of Experimental Neurobiology
arpad.csatho@aok.pte.hu

Fatigue is known to have detrimental effect on many cognitive operations including the attentional alteration between two different tasks. Previously, fatigue sensitivity of task-switching ability has been examined with unimodal stimuli only. Therefore, this study was addressed to the effect of mental fatigue induced by Time-on-Task (ToT) on cross-modal attentional switching. We assumed that switching between modalities demands high attentional cost and so it might be sensitive to fatigue related decline in attentional capacity. We adapted a cross-modal switching task for ToT paradigm [Lukas et al, 2014, Acta Psychologica, 153]. Visual and auditory stimuli were presented simultaneously and participants needed to decide if the stimulus in the cued modality was presented for a short or a long duration. The experiment had two phases. First, participants (N=20) performed the temporal judgment task for 1.5 hours without rest (2000 trials in total). Subjective fatigue, reaction time, error rates, blink rates, and electrocardiogram were recorded. Second, participants had a resting period (15 minutes) followed by an additional block of trials. Results yielded a non-modality specific increment in switching cost as a function of ToT. Performance was significantly improved by resting. In addition, heart rate variability was found to show ToT related changes.

Age differences in the flexible use of cognitive control: ERP and behavioral evidence for life-span differences in reactive and proactive control

Daniela Czernochowski
University of Kaiserslautern, Center for Cognitive Science
czernochowski@sowi.uni-kl.de

In many situations, a rapid selection between conflicting response alternatives is necessary. The Dual Mechanisms of Control framework (Braver, 2012) posits that correct response selection can be based on either proactive or reactive control. I will present a series of experiments in which various levels of response conflict were induced. Event-related potentials (ERPs) were recorded to identify dissociable neural correlates for both control processes in young and older adults as well as children. Young adults were able to flexibly adjust their response criteria according to changing task demands, as evident in efficient task preparation and the selective use of reactive control for the most demanding task conditions. Conversely, older adults showed difficulties in task preparation and higher overall response conflict, but selected the correct responses at the expense of long RTs by relying on reactive control processes regardless of task demands. Hence, older adults appear unable to adjust to the current task demands. Finally, ERPs suggest that conflict detection is functionally mature even in young children. However, increased conflict did not lead to increased cognitive control on the subsequent trial for children, as younger children in particular were unable to translate conflict into correct response selection despite long RTs.

Proactive Item Distortions in Visual Working Memory

Stefan Czoschke[1], Benjamin Rahm[2], Benjamin Peters[1], Jochen Kaiser[1] & Christoph Bledowski[1]
[1]Goethe University, Institute of Medical Psychology; [2]Albert-Ludwigs-University, Medical Psychology and Medical Sociology
stefan.czoschke@gmail.com

While current models of working memory assume that mnemonic representations are stored independently of one another, recent studies have observed systematic inter-item interactions in sensory working memory tasks. However, both the processing stage and the circumstances under which these interactions occur have yet to be investigated systematically. In a series of experiments, we found that proactive interactions depend on the spatio-temporal characteristics of item presentation. We presented two random-dot patterns sequentially at the same or different retinal positions under varying inter-stimulus intervals (ISI) and measured systematic response biases induced by their directional relations. Items presented at different retinal positions showed a proactive repulsion effect for very brief ISIs that disappeared at temporal separations of 500 ms. In contrast, when items were presented at the same retinal position, proactive repulsions occurred even for ISIs of 2s. A direct perceptual comparison task revealed that these interactions were not purely perceptual but increased in the post-encoding phase. In summary, our results suggest that proactive distortion effects appear under conditions that put great demands on interference protection (high temporal or spatial proximity of concurrent stimuli) and rely partly on interactions on the memory level.

Sudden, but not incremental insights lead to Aha! experiences

Amory H. Danek, Joshua Williams & Jennifer Wiley
Universität Heidelberg, Allgemeine und Theoretische Psychologie
amory.danek@psychologie.uni-heidelberg.de

Suddenness in the emergence of solution due to changes in problem representation, and the subjective Aha! experience are thought to be the two main features of insightful problem solving. However, little work has demonstrated a connection among these cognitive and affective solution features. We used importance-to-solution ratings as a way to track participants' problem solving process and hypothesized that solutions exhibiting sudden-change patterns ("insight-like" solutions) would be more likely to be connected to self-reported Aha! experiences than those with incremental-change patterns. Participants viewed a set of magic trick videos with the task of finding out how each trick worked, and rated six action verbs for each trick (including one that implied the correct solution) multiple times during solution. They were also asked to indicate the extent to which they experienced an Aha! moment. Within correct solutions, sudden-change patterns led to higher Aha! ratings than incremental-change patterns. The results show a connection between sudden changes in problem representations (leading to correct solutions) and the subjective appraisal of solutions as an Aha! experience. This offers the first empirical support for a close relationship between two theoretical constructs that have traditionally been assumed to be related to insightful problem solving.

COGNITION AND INHIBITORY PROCESSES IN INTERNET ADDICTION: STROOP-RELATED FMRI STUDY

Gergely Darnai, Beatrix Lábadi, András Norbert Zsidó, Orsolya Inhóf, Gergely Orsi, Gabor Perlaki, Szilvia Nagy & Jozsef Janszky
University of Pecs, Department of General and Evolutionary Psychology
darnai.gergely@pte.hu

Previous studies showed that impaired brain activity in the default mode network (DMN) and attentional control network (ACN) are strongly related to addictions. It explains several attached symptoms, including cognitive control deficits and impaired attention. Although internet addiction (IA) is becoming an important mental health issue, the DMN and ACN-related studies are sparse. Sixty young right handed subjects were included from which 30 were considered as internet addicts based on PIUQ and 30 were considered as normal users. Task-related activations and deactivations were assessed using event-related fMRI design in a verbal STROOP task and non-verbal SIMON task. Based on previous studies incongruent stimuli and the contrast between incongruent and congruent stimuli were analyzed. Activations in DMN-related structures were negatively correlated with PIUQ scores during the incongruent stimuli, whilst activations in ACN-related structures were significantly related to PIUQ subscores in incongruent-congruent contrast. According to our result similarly to other addiction forms problematic internet use is also related to DMN and ACN activity and these relationships have several clinical significances. First, we suggest that IA is a substantive psychiatric condition. Secondly, despite of several brain-related similarities between IA and substance addictions IA might lead to specific cognitive and behavioral effects.

banto - a free participant recruitment and booking system

Stephan de la Rosa
Department of Perception, Cognition and Action, Max Planck Institute for Biological Cybernetics
delarosa@tuebingen.mpg.de

Many psychological experiments require human participants for which researchers often need to share the same equipment (computers, fMRI scanners, etc.). As a result recruitment of participants is a time consuming task that requires coordination between researchers. Here we present a new free online tool for participant recruitment called Banto that manages participant recruitment and equipment booking. Banto was partially developed with the help of the Department of Perception, Cognition and Action at the Max Planck Institute of Biological Cybernetics, Tübingen, Germany. Banto works like an online posting board: experimenters post their experiments and participants sign up for them. Once a participant signs up for an experiment appointment, all equipment that experimenters specified as necessary for the experiment (e.g. computers, rooms) is automatically booked along. While Banto is free to use we ask users to support the project by claiming some overhead costs for participant recruitment in future grant applications.

A sensorimotor prior for succesful reaches

Nienke B Debats[1] & Herbert Heuer[2]
[1]Bielefeld University, Cognitive Neurosciences & CITEC; [2]Leibniz Research Centre for Working Environment and Human Factors
nienke.debats@uni-bielefeld.de

In our previous work on multisensory integration, we coincidentally observed somewhat puzzling biases in a goal-directed reaching task: participants' judgments of their final hand positions appeared to be biased towards the intended final positions. We here report a single study that reveals an intriguing origin of these biases. In the experiment, participants made reaching movements with their right hand on a trackpad (no visual feedback). A visual target was shown briefly before movement onset. Participants judged either the remembered target or final hand position. We found mutual biases that were so strong that the judged target and hand positions were essentially identical. The biased judgments' characteristics were consistent with optimal integration model predictions, showing that humans integrate the sensed and intended final position in reaching, thereby losing access to the independent estimates. The occurrence of sensory integration depends on common-cause assessments that are based on online sensory evidence and prior assumptions. As sensory causality evidence is lacking in our task, the integration of actual and intended reach positions must be purely based on prior assumptions about the redundancy of target and hand position information. This implies that humans have a strong prior for successfully reaching their intended goal position.

Influence of ID speech and singing on 12-month-olds' social preferences

Franziska Degé[1], Sandra Trehub[2] & Gudrun Schwarzer[1]
[1]Justus-Liebig-University, Developmental Psychology; [2]University of Toronto Mississauga
franziska.dege@psychol.uni-giessen.de

Infants exhibit social preferences for unfamiliar adults who speak a familiar rather than unfamiliar language (Kinzler et al., 2007). We evaluate the possibility of social preferences for unfamiliar women who engage in ID speech or singing involving a familiar language (German) and vocal register (ID). We used the Kinzler et al. (2007) social-choice task to ascertain whether 12-month-olds exhibit more affiliative tendencies toward a woman who sings than to one who speaks. In four trials, 23 (13 male) 12-month-olds (mean age: M = 12.58 months, SD = 0.26) watched successive videos (counterbalanced order) in which one unfamiliar woman spoke and another sang in ID manner. Afterwards, speaker and singer silently introduced identical toys on side-by-side videos (side of singer and speaker counterbalanced), then offered the toys to infants, at which point real versions of the toys appeared. Infants' choice was recorded. A repeated measures ANOVA revealed that infants' toy choices favored the singer (M = 2.25, SD = 1.07) over the speaker (M = 1.4, SD = .88), $F(1,19) = 4.39$, $p = .05$, $eta^2 = 0.19$. In short, ID singing promoted affiliative tendencies in 12-month-olds, as reflected in the greater incidence of taking toys from singers than from speakers.

Neural Correlates of Face Perception in an Inattentional Blindness Paradigm: A Simultaneous EEG-fMRI study

Torge Dellert, Miriam Müller-Bardorff, Maximilian Bruchmann & Thomas Straube
Institute of Medical Psychology and Systems Neuroscience, University of Münster
torge.dellert@uni-muenster.de

Recent advances in the search for the neural correlates of consciousness (NCC) have emphasized the role of temporo-occipital visual brain areas, while fronto-parietal areas seem to be recruited by task-related processes following stimulus awareness. The present simultaneous EEG-fMRI study aimed at dissociating the neural correlates of stimulus awareness and task-related processing with the help of a three-phase, no-report inattentional-blindness paradigm based on Shafto & Pitts (2015). In phase 1, more than 70 healthy subjects performed a demanding distractor task while line drawings of faces and control stimuli were presented centrally. One third of the subjects reported inattentional blindness to the faces in phase 1. In phase 2, subjects performed the same distractor task, but all participants were informed about the task-irrelevant faces. In phase 3, faces became task-relevant. Our EEG results largely replicated the findings of Shafto and Pitts, dissociating the roles of awareness and task-relevance. In fMRI, activation of ventral visual brain areas differed between inattentionally blind subjects and spontaneous noticers, indicating a central role of these structures in conscious face perception. In contrast, task relevance activated different brain areas including fronto-parietal regions and the default-mode network. Limitations and implications for contemporary theories of conscious perception are discussed.

Eyewitness performance in sequential lineups: A ROC-based analysis of order effects

Birk Diedenhofen, Sonja Willing & Jochen Musch
University of Düsseldorf
birk.diedenhofen@uni-duesseldorf.de

Previous studies based on the analysis of ROC curves have shown that sequential lineup procedures do not outperform simultaneous lineups in terms of suspect discriminability. To explore a potential drawback of sequential lineups, we investigated whether the sequential presentation of suspects is more susceptible to order effects than a simultaneous presentation if a foil looking similar to the suspect is present. To this end, we manipulated the order in which the suspect and a similar foil were presented in an online experiment. When a similar foil was presented after the suspect, there was no difference in discriminability between the two lineup types. When a similar foil was presented prior to the suspect, however, we found discriminability to be lower in sequential lineups than in simultaneous lineups. ROC analyses confirmed that the sequential lineups suffered from unwanted order effects. Eyewitnesses tended to prematurely pick similar foils and were therefore more likely to miss the perpetrator in sequential lineups. Based on our ROC analyses, we recommend that contrary to prior recommendations formulated in research based on misleading diagnosticity ratios, simultaneous lineups should be preferred over sequential lineups because of their higher discriminability and robustness against unwanted order effects.

Strategies of perceptual learning and cognitive control during ultra-fast speech comprehension – a comparison between blind with/without residual vision, and sighted

Susanne Dietrich[1], Ingo Hertrich[2] & Hermann Ackermann[2]
[1]Universität Tübingen, Fachbereich Psychologie, Evolutionäre Kognition (Kognitionswissenschaft); [2]Universität Tübingen, Neurologie
s.dietrich@uni-tuebingen.de

Sprachverständnis bei schnellen Sprechgeschwindigkeiten erfordert präzise sensorische Diskriminationsleistungen und prädiktive Mechanismen. Blinde können Sprechgeschwindigkeiten von bis zu 22 Silben/s verstehen lernen, was die Leistung untrainierter Personen (8-12 Silben/s) weit überschreitet. Bisherige Untersuchungen zeigten, dass bei Blinden primär visuelle Aktivierung (V1) mit der Fähigkeit, sehr schnelle Sprechraten zu verstehen, korreliert. Im Rahmen einer Trainingsstudie wird untersucht, ob Blinde beim Erlernen dieser Fähigkeit, V1 involvieren und ob Sehbehinderte mit Restsehvermögen sowie Sehende sich diese Fähigkeit aneignen können. Alle drei Gruppen sollten mittels computerbasierter Sprachausgabe über einen Zeitraum von 6 Monaten Sprechraten von 18 Silben/s verstehen lernen. Vor und nach dem Training erfolgten Aufnahmen mittels funktioneller Magnetresonanztomographie sowie behaviorale Tests zum Sprachverständnis. Nach dem Training zeigten alle drei Gruppen einen ähnlichen Trainingserfolg. Klassische linkshemisphärische Areale des Sprachverständnisses waren nach dem Training in allen Gruppen bei schneller Sprechrate aktiviert. Unterschiedliche Aktivierungsmuster zeigten die Gruppen in rechtem V1 (Blinde), Insula (Sehende) – eng verbunden mit dem auditorischen Kortex – und postzentralen Gyrus (PoCG, Sehbehinderte). Alle Gruppen zeigten Aktivität in der supplementär motorischen Area (SMA): pre-SMA (Blinde, Sehende) und SMA proper (Sehbehinderte). Die Ergebnisse zeigen, dass sowohl perzeptuelles Lernen (V1, Insula, PoCG) als auch kognitive Kontrollmechanismen (SMA) unterschiedliche Strategien der drei Gruppen widerspiegeln.

The influence of affect on flexibility and stability in self-organized multitasking

David Dignath
University Freiburg
dignath.david@gmail.com

Cognitive control in multitasking requires stable maintenance of task-specific rules to process each task individually and flexible task switching to schedule the order of tasks appropriately. A factor that was discussed to influence both, flexibility and stability, is affect. The present research investigated how phasic affect (valence and arousal) influences flexibility and stability during self-organized multitasking. We used a procedure that combines features of voluntary task switching with features of response interference tasks. Results showed that high arousal, irrespective of valence, impaired flexibility in terms of increased switch costs. Furthermore, task choices imply that transient fluctuations of task-irrelevant negative affect trigger voluntary task switches away from the negative affect associated task. No influence of affect in stability was observed. In light of these results, we discuss whether flexibility and stability might be dissociable attributes of cognitive control. Yet, additional correlational analyses between measures of flexibility and stability are more in line with a unidimensional construct.

Joint visual attention and locomotor experience: A longitudinal study with typically developing infants and infants with locomotor delay

Julia Dillmann, Gloria Gehb, Christian-Dominik Peterlein & Gudrun Schwarzer
Justus-Liebig-University Giessen, Department of Developmental Psychology
Julia.Dillmann@psychol.uni-giessen.de

Several studies have shown that locomotor experiences facilitate the development of joint attention skills in typically developing infants and in infants with spina bifida (e.g. Campos et al., 1997; Campos, Anderson, & Telzrow, 2009). Therefore, in the present study we investigated the development of joint visual attention skills of 11 infants with locomotor delay due to congenital idiopathic clubfoot (e.g. Garcia et al., 2011) and 14 typically developing infants. All infants were tested longitudinally at the ages of 6, 9, 12 months and, additionally, 1 to 2 weeks and 5 to 6 weeks after their onset of crawling with a following of point and gaze gesture task (Campos et al., 1997; 2009). Our results confirmed a delayed onset of crawling in clubfoot infants; however, our results did not show poorer joint attention performances in those infants. Moreover, our results demonstrated a positive effect of crawling in typically developing infants at the age of 9 months. Taken together, our results indicated a more complex interrelation between the development of joint attention skills and locomotor experiences than expected so far. Further research is needed to gain a deeper understanding of this link in typically as well as in locomotor delayed infants.

If it's hard to understand, try harder! More evidence for processing adjustments to auditory (dis-) fluency

Thomas Dolk, Claudia Freigang, Johanna Bogon & Gesine Dreisbach

thomas.dolk@psychologie.uni-regensburg.de

An increasing amount of studies indicates that experiencing increased task demands triggered for example by conflicting stimulus features or low perceptual fluency lead to processing adjustments. While these demand triggered processing adjustments have been shown for different paradigms (e.g., response conflict tasks, perceptual disfluency, task switching, dual tasking), most of them are restricted to the visual modality. By adapting the experimental design of the initial processing-fluency-paradigm by Dreisbach and Fischer (Psychological Research, 75, 376–383 (2011)) to the auditory modality, the present study investigated as to whether the challenge to understand speech signals would also lead to processing adjustments. To that end, we used spoken number words (one to nine) that were either displayed with high (clean speech) or low perceptual fluency (i.e., vocoded speech as used in cochlear implants – Experiment 1; speech embedded in multi-speaker babble noise as typically faced at bars – Experiment 2). Participants had to judge the spoken number words as smaller or larger than five. Results show that the fluency effect (performance difference between high and low perceptual fluency) in both experiments was smaller following disfluent words. Thus, if it's hard to understand, you try harder.

Neural transfer of training in task switching in old age

Sandra Dörrenbächer, Hubert Zimmer & Jutta Kray
Saarland University, Psychology
S.Doerrenbaecher@googlemail.com

Neural transfer of training in cognitive control has been assumed to occur if brain-activation changes associated with the training and transfer tasks rely on spatially overlapping brain regions. Here, we aimed at examining whether the amount of transfer also depends on temporal overlap, that is, on overlapping sustained (block-related) or transient (trial-related) timescales of the involved neural processes. We assigned a sample of 50 older adults to a task-switching training or an active control group, and administered two transfer paradigms, either sensitive to capture sustained (a delayed-recognition working-memory task) or transient dynamics of cognitive control (a context-updating task). These were approached by the appropriate block-related or event-related functional magnetic resonance imaging design. Neural transfer was defined as selective changes in task activation during the transfer task after task-switching training compared to the control group. Results indicated neural transfer (a) to the sustained-sensitive delayed recognition task in regions and timescales overlapping with the training task (spatio-temporal overlap); and (b) to the transient-sensitive context-updating task on the same timescale but in different regions than in the training task (only temporal overlap). These results suggest that task-switching training can foster better temporal organization of control processing also in other control tasks.

The end-state comfort effect in joint action

Dominik Dötsch & Anna Schubö
Philipps-Universität Marburg, Department of Psychology
dominik.doetsch@uni-marburg.de

Human agents tend to end their movements in relatively comfortable postures, even when this requires uncomfortable initial postures. In a series of experiments we investigated whether agents also anticipate a partner's end-state comfort in a joint action task. Participants performed a joint pick-and-place task in a naturalistic, breakfast-table-like paradigm: they transported a wooden cup from one end of a table to the other, with one agent moving it to an intermediate position and their partner transporting it to the goal. Hand and finger movements were recorded via 3D motion tracking, gaze was recorded with portable eye-tracking glasses. Results showed that the orientation of the first agent's grip when they picked up the cup was affected by the required cup orientation at the goal position. Most agents adapted the rotation of the cup's handle when they placed it on the intermediate position to the joint action goal, thereby facilitating the partner's subsequent movement. These results suggest that human agents tend to represent a partner's end-state comfort and integrate it into their own movement planning in cooperative joint action. However, social factors like group membership and personality traits modulate this tendency.

Investigating the temporal dynamics of object-scene integration using MVPA: The role of the N300/N400 complex in object perception

Dejan Draschkow, Edvard Aslak Heikel, Melissa L.-H. Võ, Christian J Fiebach & Jona Sassenhagen
Goethe University Frankfurt
draschkow@psych.uni-frankfurt.de

Typically investigated by violating certain environmental expectations and regularities (e.g., a toothbrush in the fridge), a late event-related negativity (N400) has been linked to the semantic processing of language, objects and scenes. Incongruent object-scene relationships are additionally associated with an earlier negative deflection of the EEG signal between 250-350ms – often referred to as N300 – and hypothesized to reflect pre-semantic perceptual processes. We used multivariate pattern analysis (MVPA) to investigate if the early object-scene integration activity (250-350ms) shares certain levels of processing with late activity (400-600ms). Forty participants were presented with semantic inconsistencies, in which an object was incongruent with a scene's meaning. A standard ERP analysis revealed significant N300 and N400 deflections. MVPA showed above chance classification of congruent vs. incongruent object-scene relationships during both time windows. To test if neurocognitive patterns are shared between early and late components, we used a time-generalized MVPA procedure where a classifier trained at one time point in a trial is tested at every other time point. We found above chance decoding performance for classifier trained during time points of the N300 and tested during later time points of the N400. This indicates that context processing interacts with early perceptual stages of object processing.

Serial integration of information in active touch

Knut Drewing, Alexandra Lezkan & Anna Metzger
Giessen University, Department of Psychology
knut.drewing@psychol.uni-giessen.de

In active touch people often explore objects over extended time periods, using movements that consist of repetitive segments (e.g. repeated indentations or strokes). Repeating the same movement yields redundant information. While the integration of redundant information that is simultaneously available has been well described by models of optimal integration, mechanisms underlying serial integration are less clear. In several experiments, we investigated serial integration in haptic perception. Participants explored two stimuli in a sequence, with varying numbers of repetitive movement segments, and discriminated among them according to texture or softness. We manipulated texture or softness estimates derived from single movement segments of the multi-segmented movements to assess their contributions to the perceptual task. In the exploration of the first stimulus contributions of different estimates were similar, but for the second stimulus estimates associated with later as compared to earlier movement segments contributed less. In line with unequal contribution, perceptual variance decreased with an increasing number of movement segments less than expected for optimal integration. The pattern of results is well explained by assuming that the representation of the first stimulus fades when the second stimulus is explored. We model the results by a Kalman filter that considers memory decay.

Confidence Judgements and Decentering in Patients with Major Depression

Barbara Drueke
University Hospital of the RWTH Aachen University, Institute of Medical Psychology and Medical Sociology
bdrueke@ukaachen.de

Research: Patients suffering from major depression show cognitive deficits, besides there is also evidence for metacognitive deficits in memory: depressive patients tend to underestimate their performance and to be less confident in their judgements. A useful treatment for depression is the Mindfulness-Based cognitive Therapy (MBCT) which focuses on decentering. Decentering enables a person to non-judgmentally accept cognitive patterns without engaging or evaluating them through a shift in perspective. This study aims to answer the question whether there is a difference between depressive patients and controls in metacognitive skills for the domain of attention. Furthermore, the study examines the relationship between metacognitive abilities and decentering. Methods: 30 healthy participants and 30 patients with major depression were asked to make judgments of performance (JOP) and confidence judgements on a rating scale from zero to 100% regarding the Stroop test. To assess decentering participants filled out the German version of the experiences-Questionnaire (EQ-D). Results: Depressive patients reveal significantly less decentering abilities compared to healthy participants. Albeit groups' metacognitive judgments of performance do not differ, patients indicate significantly less confidence in their judgements. Finally, data reveal a significant association between decentering and confidence ratings, but not with judgements of performance.

How does preparation in task switching affect subsequent memory performance?

Mirela Dubravac
University of Bern, Experimental Psychology and Neuropsychology
mirela.dubravac@psy.unibe.ch

Switching tasks produces an immediate performance cost and also reduces later memory for switch compared to repeat items. Here we investigate whether the opportunity to prepare for task switching would modulate this memory effect. Preparation was operationalized by long vs. short inter trial intervals and by using either a predicable AABB task sequence or a cued task switching procedure. We expected that a predictable task switch will reduce cognitive conflict if enough preparation time is given. Thus, this study contributes to revealing the gradual nature of top-down control on subsequent memory performance.

Do SNS and HPA axis activity differ between elite athletes and non-athletes? – A pilot study

Moritz Dümig, Yvonne Daichendt & Linda Becker
Friedrich-Alexander-Universität Erlangen-Nürnberg, Institute of Psychology
linda.becker@fau.de

Being physically active can have many health benefits and can be protective against daily stressors. However, excessive amounts of sports can also be a stressor and can activate the stress systems. It was investigated whether the diurnal activity of the sympathetic nervous system (SNS) and the hypothalamic-pituitary-adrenal (HPA) axis differs between elite athletes and non-athletes. N = 18 (9 elite athletes, mean age = 22.2 ± 2.6 years; 13 male) participants provided seven saliva samples on a non-active day. The area under the curve (AUC) of the diurnal profiles of salivary alpha-amylase (sAA), as an index for SNS activity, and of cortisol as a marker of HPA axis activity were calculated. For sAA, no difference was found between both groups and, thus, SNS activity did not differ. For cortisol, a marginally significant difference was found ($p < .10$). The cortisol AUCs were lower in the elite athletes group (57.6 ± 66.8 nmol/l) than in the non athletes group (101.7 ± 27.8 nmol/l), supporting the view the athletes were stressed less than the non-athletes. It is concluded that doing elite sports can have an impact on HPA axis activity. However, future studies with larger sample sizes are needed.

The Effect of Attitude Accessibility on Early Components of Visual Attention

Sebastian Dummel
Universität zu Köln, Differentielle Psychologie und Psychologische Diagnostik
sebastian.dummel@uni-koeln.de

Attitudes have been suggested to serve different functions, one of them being an orienting function. That is, in a complex visual word, objects for which individuals hold attitudes may attract attention. Roskos-Ewoldsen and Fazio (1992) showed that the effect of attitudes on attention is determined by the extent to which individuals' attitudes toward objects are accessible from memory. Here we additionally examined which components of visual attention—engagement and disengagement—are affected by attitude accessibility. To manipulate attitude accessibility, participants first judged one set of pictures of objects according to their liking (high accessibility), another set according to the objects' animacy (low accessibility). Participants then performed a dot-probe task, asking them to indicate the location of a probe. Probe presentation was preceded by the presentation of two objects from the previous judgment-tasks. On critical trials, one object was from the liking-task, the other object was from the animacy-task. The probe appeared at one of the two object locations. Responses were faster when the probe replaced an object form the liking-task than when it replaced an object from the animacy-task, replicating the effect of attitude accessibility on attention. Additional analyses suggested that participants had difficulties disengaging their attention from attitude-evoking objects.

Sequential modulation of compatibility-based and no-go-based backward crosstalk – insights from diffusion model analyses

Moritz Durst & Markus Janczyk
Eberhard Karls University, Psychology
moritz.durst@psycho.uni-tuebingen.de

In multitasking, the backward crosstalk effect (BCE) means that Task 1 performance is influenced by characteristics of Task 2. For example, (1) RT1 is shorter when the two responses are given on the same (compatible trial) compared with opposite sides (incompatible conflict-trial; compatibility-based BCE), and (2) RT1 is longer when Task 2 is a no-go relative to a go task (no-go-based BCE). In two experimental sessions we investigated the impact of recently experienced trial and conflict history on the size of such BCEs. Similar to the Gratton effect in standard conflict tasks, clear sequential modulations were observed for the two kinds of BCEs, which were only present following (1) compatible trials and (2) go-trials. Recent evidence from mental chronometry studies suggests that the compatibility-based BCE is located inside the response selection stage, whilst the no-go-based BCE arises in motor execution. Against this background, a diffusion model analysis was carried out to reveal the reason(s) for the sequential modulations. As expected, for the compatibility-based BCE, changes in drift rate explain the sequential modulations, for the no-go-based BCE changes in non-decision time are important.

Crowding in real depth - The impact of size and defocus blur

Lisa Valentina Eberhardt & Anke Huckauf
Ulm University, General Psychology
lisa.eberhardt@uni-ulm.de

Crowding refers to the phenomenon of reduced stimulus recognition for peripherally presented visual targets which are flanked by similar stimuli. We tested how the depth of flanking stimuli and their relative size influenced recognition of crowded targets. Real depth was created by using two screens and merging their displays via a semi-transparent mirror. We measured recognition performance for bright Landolt rings (size 0.6°, distance 190cm), while relative depth and size of flankers compared to targets was varied. Flanker's relative depth was either in front or behind, closer (170cm, 215cm) or farther away (150cm, 240cm). Flanker's size was either physically (same amount of pixel) or retinal (0.6° of visual angle) constant. Results show, that flankers with a physically constant size interfere more with target recognition, when they are presented in front of the target, than when they are presented behind the target. In contrast, flankers with constant retinal size interfere less with target recognition, when they are presented in front compared to behind the target. This impact of flanker's relative size is more pronounced when flankers are presented farther away from the target. Thus, relative size of flanking stimuli seem to guide processing of target stimuli more than defocus blur.

Movement Primitives in Unconstrained Dance

Anna-Lena Eckert, Benjamin Knopp & Dominik Endres
Philipps-University, Department of Psychology
eckerta@students.uni-marburg.de

Motivation. According to a long-established hypothesis in motor control, the brain might rely on a discrete number of simpler elements, or movement primitives (MP), to reduce the tremendous computational burden underlying motor coordination. However, the validation of MP models from spontaneous full-body movements is rarely encountered in the literature. Methods. n=17 volunteers engaged in unconstrained dance while their movements were recorded using Xsens Awinda inertial motion capture. In the framework of Bayesian Model Selection, the fit of synchronous MP and the time-varying synergies model [1] with 3-35 components was evaluated. The model quality was approximated using the Laplace Information Criterion. [2] Results. LAP scores were optimal for models with ~16-18 MP. Furthermore, the computation of Bayes factors suggested that dance is a stimulus driven behavior which is influenced by individual characteristics rather than being purely stimulus-driven or determined only by individual characteristics. Future Research will compare other MP models (e.g., the anechoic or the spatial MP model) on unconstrained data sets. Interesting applications in perception research, computer animation and robotics are possible. [1]: d'Avella, A., & Tresch, M. C. (2002). NIPS 2002, 141-148. [2]: Endres, D. M. et al. (2013). Frontiers in computational neuroscience, 7.

Effects of reward on action-effect learning

Andreas B Eder, Thorsten M Erle & Wilfried Kunde
University of Würzburg, Department of Psychology
andreas.eder@uni-wuerzburg.de

According to modern ideomotor theory, anticipatory representations of action consequences are the basis for voluntary action control. Research suggests that reward strengthens the acquisition of action effects, and hence ideomotor learning. Participants in our experiments first learned to associate four different actions with particular auditory effects. Two effects were additionally rewarded with money, while two other effects were not rewarded. In a subsequent test phase, the auditory effects of the acquisition phase served as irrelevant response primes in a speeded reaction time task. Results showed stronger interference of incongruent primes on responses that generated rewarded effects in the previous learning phase. Critically, this effect was not obtained with associations to monetary losses that were equally salient to the participants. These results suggest that associations to rewards specifically strengthen bindings between actions and their consequences.

Seeing or hearing? – The influence of music and spatial surrounding on perceived atmosphere

Sonja Ehret, Carolin Schroeder & Roland Thomaschke
University of Freiburg, Department of Psychology
sonja.ehret@psychologie.uni-freiburg.de

Previous research has shown that music affects the emotional experience of environments. In the present study we aimed at determining how exactly music and room ambience interact in creating emotional atmosphere. By conducting two pretests we identified two rooms which strongly contrast in the valence of their perceived atmosphere. We also identified a musical piece matching each of the room with regard to perceived valence, respectively. In the experiment proper, 32 participants were exposed to the four combinations of room and music for 10 minutes each, on two different days. Immediately after exposal they rated the experienced overall atmosphere. Room valence and musical valence both significantly affected the experienced overall valence. However, a significant interaction showed that the valence of music had a stronger effect on overall atmosphere in the positive room than in the negative room. These findings suggest that positive spatial surroundings amplify the atmospheric impact of highly valent music.

Tracking awareness in binocular rivalry using induced pupil fluctuations

Wolfgang Einhäuser & Immo Schütz
Chemnitz University of Technology, Institute of Physics - Physics of Cognition Group
wolfgang.einhaeuser-treyer@physik.tu-chemnitz.de

Far from being a mere reflex, the pupil light response is modulated by attention and other cognitive factors. This modulation has been exploited to track the locus of attention as well as awareness to simple stimuli. We adapt a recently proposed method, referred to as "pupil frequency tagging", to track awareness of complex stimuli in binocular rivalry. Specifically, we present the image of a face to one eye and the image of a house to the other. This induces binocular rivalry, perception alternates between the house and the face image. We modulate the luminance of the two images in counterphase at a fixed frequency of 1.7Hz such that the overall rivalry dynamics do not change relative to the presentation of static images. By determining the phase of the pupil oscillation at this frequency in each 588ms (1/1.7Hz) presentation cycle, we demonstrate that the phase is modulated by the stimulus the observer perceives as dominant in the respective cycle. This demonstrates that awareness to complex stimuli modulates the pupil light response similar to volitional attentional shifts. These findings may also broaden the realm of pupil-based "no report" paradigms from simple patterns to complex stimuli.

Semantic not orthographic-phonological knowledge is implemented in context-based predictions during visual word recognition

Susanne Eisenhauer[1], Christian J. Fiebach[2] & Benjamin Gagl[3]
[1]Goethe University Frankfurt, Department of Psychology; [2]Goethe University, Department of Psychology; Center for Individual Development and Adaptive Education of Children at Risk (IDeA); Interdisciplinary Center for Neurosciences; [3]Goethe University Frankfurt, Department of Psychology; Center for Individual Development and Adaptive Education of Children at Risk (IDeA)
eisenhauer@psych.uni-frankfurt.de

Visual word recognition can be facilitated through predictions based on previous context. In addition, word recognition depends on prior knowledge – for example with respect to orthography or semantics. Indeed, both knowledge and context have been shown to reduce neuronal processing costs during word recognition, reflected in reduced N400 responses given increased context-based predictability and higher word frequency. However, word frequency is associated with knowledge at orthographic, phonological, as well as semantic levels, so that it remains unclear which type of knowledge most efficiently supports predictive processing of visual words. Here, we investigated the influence of semantic and orthographic-phonological knowledge on context-based predictions of visual letter-strings in magnetoencephalography data from 39 participants. Predictable contexts were realized through repetition priming, while knowledge inherently differed between letter-strings, i.e., between words (semantic, phonological, and orthographic knowledge), familiarized pseudowords (orthographic-phonological knowledge), and novel pseudowords. We observed larger M170 responses for familiarized pseudowords and words compared to novel pseudowords, replicating previous orthographic expertise effects. Furthermore, repetition resulted in reduced activations across all knowledge conditions, peaking around 370ms. Importantly, repetition suppression was enhanced for semantic, but not for orthographic-phonological knowledge. Our findings suggest that context-based predictive processes in visual word recognition rely primarily on semantic knowledge.

Delta plots with negative-going slopes as a potential marker of decreasing response activation in masked semantic priming

Ruben Ellinghaus
University of Tübingen, Department of Psychology
ruben.ellinghaus@uni-tuebingen.de

Delta plots with negative-going slopes (nDPs) reflect the phenomenon that an RT difference between two conditions is greater for relatively fast than for relatively slow responses. This unusual distributional pattern has predominantly been observed in the spatial Simon task, where it has been interpreted as reflecting the selective inhibition of an automatically activated response. The literature suggesting that a similar fading mechanism influences RTs in masked identity priming inspired us to check an analogous semantic priming paradigm for nDPs. Consistent with the findings in other paradigms, two masked semantic priming experiments revealed stronger priming effects for relatively fast than for relatively slow responses, thus reflecting an nDP. These findings are compatible with the ideas that the activation produced by masked semantic primes decreases over the course of a trial, such as that of irrelevant spatial information and of masked identity primes, and that nDPs are a general signature of within-trial decreases in response activation across different tasks and paradigms.

Are there opposite pupil responses to different aspects of processing fluency?

Sophie G. Elschner & Ronald Hübner
Universität Konstanz, Cognitive Psychology
sophie.elschner@uni-konstanz.de

As a theory of aesthetic appreciation, processing fluency postulates a preference for easy to process stimuli. Among others, it has been demonstrated – to varying degrees – that easy to process paintings elicit greater pupil response than hard to process ones do (Elschner et al., in press; Kuchinke et al., 2009). However, paintings require processing on higher, more conceptual stages where picture meaning plays an integral role in aesthetic judgment. We investigated pupil response to fluency on a more perceptual level, operationalizing processing fluency as different forms of symmetry. Participants judged whether a cloud of black dots was symmetric (on the vertical, horizontal or on both axes) or random, while pupil data was acquired. Preference ratings on a 7-point scale were obtained thereafter. Concordant with the fluency theory, response times were faster and preference ratings higher for easy to process stimuli. However, pupil size was greatest for harder to process patterns, which contradicts earlier research on pupil dilation to fluency. The dynamics of pupil size adjustments may therefore reflect processing depth rather than or in addition to ease. An experiment to rule out confounds due to task differences compared to previous research and further implications are discussed.

Dreh Dich immerzu, rundherum und rundherum: Die mentale Rotation des menschlichen Körpers um die vertikale Achse

Franziska End, Mirjam Ebersbach & Markus Krüger
Ernst-Moritz-Arndt-Universität Greifswald
markuskr@uni-greifswald.de

Im Gegensatz zur mentalen Rotation von abstrakten Reizen wird bei der Rotation menschlicher Körper oder Körperteilen nicht immer der kürzeste Weg der Transformation gewählt, sondern es werden physiologische Bewegungsmöglichkeiten und die Position des eigenen Körpers berücksichtigt (Embodiment). In unserer aktuellen Studie untersuchten wir die mentale Rotation von menschlichen Körpern. Es wurde eine abgebildete Person mit erhobenem Arm gezeigt, die um 0°, 45°, 90°, 135° oder 180° (0° Rückansicht, 180° Frontansicht) um eine vertikale Achse rotiert war. Die Aufgabe der Probanden war es zu entscheiden, welcher Arm gehoben wurde. Die Reaktionszeiten stiegen linear mit dem Rotationswinkel an. Dies bedeutet, dass die Probanden auf analoge mentale Transformationen zurückgriffen, um die Aufgabe zu lösen. Es gab jedoch auch Abweichungen von einem strikten linearen Verlauf. So fiel bei der Rotation um 180° der Anstieg der Reaktionszeiten – im Vergleich zu den anderen Winkeln - geringer aus als erwartet. Dies steht im Einklang mit Berichten einiger Probanden, dass sie bei dieser totalen Frontansicht auf andere Strategien zurückgriffen, wie zum Beispiel den Körper zu kippen oder zu spiegeln. Solche Abweichungen von einem linearen Verlauf könnten ein Hinweis auf Embodiment im Sinne eines direkten Abgleiches des Gesehenen mit dem eigenen Körper sein.

Embodied simulations guide the alignment of reference frames in visuo-spatial and psychological perspective-taking

Thorsten Michael Erle
University of Würzburg
thorsten.erle@psychologie.uni-wuerzburg.de

Perspective-taking means “trying to understand another’s point of view”, either literally (visuo-spatial) or metaphorically (psychological perspective-taking; e.g., in empathy). Functionally both kinds share the same structure: the perspective-taker initiates a switch from the egocentric frame of reference to an other-centered frame of reference. Research on visuo-spatial perspective-taking has shown that this involves an embodied simulation, where the body of the perspective-taker is transposed into the physical location of another person. The present talk applies this embodied transformation account to psychological perspective-taking – an area where the underlying mechanisms are yet unclear – and investigates whether psychological characteristics can impact this embodied simulation. In a first series of studies, participants completed a visuo-spatial perspective-taking paradigm that induces the above-mentioned embodied simulation. It was measured whether this simulation affects psychological perspective-taking (measured by perceived similarity or sympathy for another person) and indeed this was the case. In other studies, it was tested whether this embodied simulation in visuo-spatial perspective-taking can be affected by imbuing another person with psychological characteristics (e.g., similarity or sympathy) and again, the hypothesis was confirmed. These results suggest that embodied simulations guide the alignment of different reference frames for both visuo-spatial and psychological perspective-taking.

P3 and pupil dilation predict the subjective experience of time

Benjamin Ernst & Marco Steinhauser
Catholic University of Eichstätt-Ingolstadt
benjamin.ernst@ku.de

A common experience is that when something unexpected happens, time appears to slow down. Prior research identified an arousal response as a possible underlying source of this time dilation illusion. Concerning the neural basis of this response, our recent results suggest the phasic release of norepinephrine (NE) as a likely candidate. To further test this hypothesis, the present study investigated two indices of phasic NE release, the P3 and pupil dilation, in a visual oddball task. Participants were asked to estimate the duration of infrequent oddballs relative to a preceding standard duration. As expected, the P3 amplitude as well as pupil dilation predicted subsequent time perception. While overestimations were preceded by a pronounced P3 and pupil dilation, these correlates of the phasic NE release were attenuated before underestimations. Moreover, we found that the number of standard stimuli preceding an oddball affected all three measures in the same direction with larger numbers being associated with a longer perceived duration, a larger P3 amplitude, and a larger pupil dilation. Finally, individual average time estimates and pupil dilations were predicted by the average P3 amplitude. Together, these results support the assumption that the phasic release of NE contributes to time dilation.

Novel non-salient stimuli detract attention from a novel color singleton

Daniel Ernst[1], Stefanie Becker[2] & Gernot Horstmann[1]
[1]Bielefeld University & CITEC, Neuro-cognitive Psychology; [2]University of Queensland, School of Psychology
daniel.ernst@uni-bielefeld.de

A common question in visual attention research is to which extend attention is biased by bottom-up factors such as saliency and by top-down factors governed by the task. Expectation discrepancy, as another factor, is supported by visual search experiments in which participants see a novel stimulus unannounced and for the first time after several familiarization trials. Recent experiments have shown that the surprising stimulus does not have to be singled out by saliency in order to draw attention. In a current eye-tracking study, where in the surprise trial a singleton was presented for the first time, we manipulated the novelty of the non-singleton feature. In the familiar non-singleton color condition, the surprising singleton is the only novel element, whereas in the novel non-singleton color condition, the non-singleton elements are likewise novel. If attention is biased towards novelty, we expect that the singleton captures attention earlier if the non-singletons have a familiar rather than a novel color. Results supported this prediction, with gaze being directed earlier on the singleton in the familiar rather than in the novel non-singleton condition. These results further support the potential of surprising non-salient stimuli to attract attention even in competition with a surprising color singleton.

Statistical and orthographical influences on handwriting in German

Jessica Ernst & Eva Belke
Ruhr-Universität Bochum, Sprachwissenschaftliches Institut
ernst@linguistics.rub.de

While spoken word production has been researched intensively for decades, much less is known about written word production. We investigated whether and how the production of written words in German by young and older adults and late primary and early secondary school children was influenced by statistical word properties (bigram frequencies, Experiment 1) and double letter spellings (as in Falle vs. Falte, Experiment 2). Participants were asked to copy words from a computer screen onto a tablet, while their reaction times and measures of stroke duration, pause duration, pressure and writing velocity were recorded, using a special software (Ductus, see Guinet and Kandel, 2010). We are currently in the process of data coding and analysis. We expect that our data will elucidate at which age writers start to use internalized frequency information and orthographic knowledge for writing. In the long run, we hope to make a relevant contribution to didactic concepts for teaching spelling in primary school in Germany.

Guidance or Setting? Exploring the learnability of computer-based instructions in a construction task

Shirin Esmaeili Bijarsari, Maria Wirzberger & Günter Daniel Rey
TU Chemnitz, Psychology of learning with digital media
s.esmaeili.bijarsari@googlemail.com

Computer-based technology is becoming increasingly relevant in teaching environments. This results in enhanced multimodality, but also the necessity of change in teaching methods to achieve optimal learnability of aspired contents. An integral part of learning, the interplay between mental resources and different facets of learning scenarios, is reflected in the cognitive load construct, addressed by the Cognitive Load Theory. The theory suggests that influencing certain aspects of teaching will reduce demands on learners' resources and foster the acquisition of knowledge. The presented study (N = 78, M = 23.1, SD = 3.5) observed changes in cognitive load during the construction of two LEGO® Mindstorms robots in a 2x2-factorial design. Process-related variations in teaching methods occurred due to the extent of visual guidance in the instructions, based on the guidance fading principal. Moreover, color coding of the materials in both the instruction and setting was applied, inspired by evidence from the field of embodied cognition. The level of task-related cognitive load was observed by a repeated audio-verbal secondary task during the construction process and questionnaires on participants' subjective cognitive load perception. Multiple-choice tests adressed retention and transfer of the obtained knowledge. Results as well as theoretical and practical implications are presented.

Crow's feet and frown lines – Successful automatic extraction of authenticity of emotional facial expressions depends on the surrounding context

Vincent Exner[1], Andrea Paulus[2] & Julia Kozlik[1]
[1]University of Greifswald, Psychological Institute; [2]Technical University of Munich, Chair of Psychology
vincent.exner@uni-greifswald.de

Natural, genuine smiles evoked by felt happiness tend to differ visually from voluntary, posed smiles. The major difference lies in the absence of the contraction of the orbicularis oculi – posed smiles lack the proverbial crow's feet. It has been demonstrated recently that humans are able to automatically extract whether a facial expression is felt (i.e., authentic) or not, as non-authentic expressions elicit significantly smaller affective priming effects. This study proposes that the successful automatic extraction of authenticity from emotional facial expressions depends on its saliency, determined by the surrounding context in which non-authentic expressions are encountered. Non-authentic smiles were presented as primes in an affective priming procedure. The context was manipulated by alternating these primes with primes showing authentic smiles in one experimental block, and with primes showing frowning faces in a second block, thus inducing a higher saliency of authenticity in the first block. We found that non-authentic smiles elicit a considerably smaller affective priming effect when surrounded by authentic smiles, as compared to the context of frowning faces. These results indicate that extraction of authenticity is context-dependent: posed expressions are more likely to be processed as non-authentic when authenticity (rather than emotional valence) is salient.

Rapid spatiotopic updating across saccades

Jasper Fabius
Utrecht University, Helmholtz Institute, Experimental Psychology
j.h.fabius@uu.nl

The retinotopic organization of visual information is shifted with each saccade. Yet, we experience a continuous stream of visual information. The discrepancy between the disrupted retinotopic organization and apparent perceptual continuity of visual information has been studied for centuries. There is still an ongoing debate whether perceptual continuity across saccades is illusory, or whether retinotopic representations of visual information are updated across saccades. Recent studies provided a considerable amount of evidence in favour of spatiotopic updating of visual information, enabling perceptual continuity. Importantly, these studies showed that the build-up of spatiotopic coding takes up to 500 ms, plus saccade latency. Under normal viewing conditions, this would be too slow to support perceptual continuity, since saccades are made roughly every 300 ms. With a series of experiments involving a motion illusion (High Phi), we demonstrate that spatiotopic updating can occur within the latency of normal visually guided saccades, and that the effect of spatiotopic updating can be measured very rapidly after saccade offset. Together, our results provide a behavioural demonstration of rapid spatiotopic updating of visual information, that directly demonstrates perceptual continuity across saccades.

Investigating phonemic representations in Spanish-English bilinguals using mouse-tracking: A laboratory/MTurk comparative study

James Benjamin Falandays[1], Michael J Spivey[1] & Joseph C Toscano[2]
[1]University of California Merced, Cognitive and Information Sciences; [2]Villanova University, Psychological and Brain Sciences
jfalandays@ucmerced.edu

Languages vary in the acoustic properties of their phonemes. For example, the English /b/ is acoustically similar to the Spanish /p/. A debate in psycholinguistics concerns whether bilinguals have separate phoneme representations for each language, or one set shared cross-lingusitically. If bilinguals have separate phonemic representations for each language, one might expect that they will respond differently to a given acoustic stimulus depending on which language-specific representations they access. This hypothesis was tested using mousetracking methods in the laboratory and on MTurk. Comparing results between these two platforms may yield insights into mousetracking methods. Bilingual subjects were placed into either an English-speaking mode or a Spanish-speaking mode, with a monolingual English group as control. On each trial, subjects viewed pictures of objects for Spanish or English word-initial minimal pairs (e.g. "bear" vs. "pear," or "beso" vs. "peso") and heard speech stimuli varying along a continuum from a pre-voiced /b/ to a voiceless aspirated /p/. Subjects clicked the image whose name begins with the phoneme they heard. Language background data were collected to determine how effects vary with individual language experience. Mouse trajectory results are discussed with respect to the debate regarding how separate or conjoined bilinguals' phonemic representations are.

Does social-emotional feedback diminish age-related learning impairments?

Nicola Kristina Ferdinand
Saarland University, Department of Psychology
n.ferdinand@mx.uni-saarland.de

Many cognitive functions decline with increasing age. By contrast, processing of affective information seems to remain relatively intact. Recent research has also demonstrated that affective influences can modulate cognitive functioning and lead to an enhancement in diverse cognitive tasks. The aim of this event-related potentials (ERP) study was to examine, whether affective material can ameliorate age-related impairments in feedback-induced learning. For this purpose, we used a probabilistic learning task in which younger (19-30 years) and older (70-79 years) participants learned the assignment of pictures to response keys via feedback. Feedback consisted of either emotionally neutral faces (with different background colors for positive vs. negative feedback) or emotional faces (smiling vs. disgusted-looking). Emotional feedback resulted in better learning for older but not younger adults. ERPs showed that the initial stage of feedback processing (reflected in the Feedback-Related Negativity, FRN) was not modulated by feedback emotionality. In a later stage reflecting working memory updating after task-relevant events (indexed by the P300), younger adults updated more after negative feedback in general. However, older adults did so only after negative emotional feedback. We infer that social-emotional feedback seems more relevant for older adults than neutral feedback and thus improves feedback-induced learning.

Predicting Visual Attention is not an easy Task - even for Experts!

Sebastian Feuerstack[1] & Bertram Wortelen[2]
[1]OFFIS; [2]Carl von Ossietzky Universität Oldenburg, Kognitive Psychologie
feuerstack@offis.de

With more and more systems working autonomously on our behalf, like air planes, trains, ships, cars or factories, the role of a human changes from interaction and control to supervision and intervention. But how to design such autonomous system interfaces so that they can efficiently be monitored by a human? In a study with 20 car drivers and 8 human factors (HF) experts we figured out that individuals are in fact not very good in predicting visual attention for even a simple task like an overtaking maneuver on a highway compared to the visual attention distribution that we measured with an eye tracker in a car driving simulator with the same car drivers (Individual HF expert: R2=0.15/SD=0.259; Individual car drivers: R2=0.10/SD=292). Interestingly, averaging individual predictions massively improves the prediction quality (car drivers: R=0.52; HF experts: R=0.94). We present a software tool that can efficiently capture operator domain knowledge from large and geographically distributed expert groups via the web, can simulate human visual attention based on a cognitive model, and finally generates valid visual attention predictions. We argue that the insights gained by such models will improve interface designs.

Visual stability influences aesthetic appreciation

Martin Georg Fillinger & Ronald Hübner
University of Konstanz, Psychology
martin.fillinger@uni-konstanz.de

Pictures whose arrangement of elements are considered as balanced are usually liked more than pictures with an unbalanced arrangement. This phenomenon motivated researchers to invent formal measures of visual balance, most of which rely on physical concepts such as the symmetry of the distribution of 'mass', or the distance of the center of 'mass' from the center of the picture. Although these measures predict balance and liking ratings, at least for simple images, they are not, or only partly, sensitive to image rotation. In our study, however, where we used rotated versions of pictures constructed of several polygons, we found that balance and liking ratings were reliably affected by rotation. From this result, we hypothesized that visual stability in the sense of the 'gravitational' stability of the picture elements might also contribute to judgments of visual balance. As expected, further experiments, in which participants had to judge balance or stability of such stimuli, revealed a strong correlation between the two corresponding ratings. Moreover, there was a reliable association between stability ratings and liking. In contrast, the balance measures failed to predict liking consistently. Together, our results suggest that the concept of visual balance should be extended by visual stability.

Modality compatibility biases voluntary choice of response modality in task switching

Edina Fintor, Edita Poljac, Denise N. Stephan & Iring Koch
RWTH Aachen University
edina.fintor@psych.rwth-aachen.de

The term modality compatibility refers to the similarity between stimulus modality and the modality of response-related sensory consequences (e.g., vocal responses produce auditory effects). Previous results showed smaller task-switching costs when participants switched between modality compatible tasks (auditory-vocal and visual-manual) compared to switching between modality incompatible tasks (auditory-manual and visual-vocal). In the present study using a voluntary task switching paradigm (VTS), participants chose the response modality (vocal or manual) to indicate the location of either a visual or an auditory stimulus. We examined whether free task choices were biased by modality compatibility, so that modality compatible tasks are preferred in VTS. The choice probability analysis indicated that participants tended to choose the response modality which is compatible to the stimulus modality. We also found that when participants switched the response modality, they switched to the modality compatible tasks more often. More interestingly, even though participants freely chose the response modality, modality compatibility still influenced task-switching costs, showing larger costs with incompatible mappings. The findings that modality compatibility influenced choice behaviour suggest components of both top-down control and bottom-up effects of selecting a response modality for different stimulus modalities.

Binding between memory representations influences serial dependence

Cora Fischer[1], Stefan Czoschke[1], Benjamin Peters[1], Benjamin Rahm[2], Jochen Kaiser[1] & Christoph Bledowski[1]
[1]Goethe-University, Institute of Medical Psychology; [2]Albert-Ludwigs-University, Medical Psychology
cora.fischer@med.uni-frankfurt.de

Serial dependence refers to a systematic bias that attracts present towards recent visual inputs. It has been assumed to increase the stability of perception, as recently attended input has the strongest bias. Recent studies have suggested that serial dependence is a mnemonic rather than a purely perceptual phenomenon. However, studies so far have required memorizing only a single item at a time. Hence, it remains unclear which factors besides temporal proximity influence serial dependence. One possibility is that attraction could be tuned by factors that bind items into an object across trials. To examine this, we asked subjects to memorize two sequentially presented stimuli (S1 and S2). In addition, items had one of two possible colors. Hence, across trials items could be bound together either by their corresponding serial position or color. Serial dependence was enhanced for items with congruent serial position, i.e. the current S1 was attracted more strongly to the previous S1 than previous S2, and S2 was biased more strongly by the previous S2 than previous S1. In contrast, color congruency did not modulate serial dependence. These findings indicate that serial position of items encoded into working memory determines serial dependence in addition to temporal proximity.

The sensory-motor nature of number concepts and arithmetic

Martin H. Fischer[1] & Samuel Shaki[2]
[1]University of Potsdam; [2]Ariel University
martinf@uni-potsdam.de

The concept of number has traditionally been considered as a prototypical instance of abstract(ed) knowledge. It denotes the size of any arbitrary set of objects, thus seemingly preventing systematic correlations with sensory or motor features. Yet, numerosity does co-vary with physical parameters in perception and action. In this presentation, we describe how number processing obligatorily activates sensory and motor features: both sensory and motor processing are improved in left vs. right space following the presentation of small vs. large numbers. These links are bi-directional and suffice to identify numbers as embodied concepts. Moreover, these space-magnitude associations influence mental arithmetic and everyday quantitative reasoning (cf. Fischer & Shaki, 2014). Implications for research and theorizing will be discussed. Reference: Fischer, M. H. & Shaki, S. (2014). Spatial Associations in Numerical Cognition: From single digits to arithmetic. Quarterly Journal of Experimental Psychology, 67(8), 1461-1483.

Arousal drives adaptation to conflict: Transcutaneous vagus nerve stimulation (tVNS) enhances conflict-triggered adjustment of cognitive control

Rico Fischer[1], Carlos Ventura-Bort[2], Alfons Hamm[1] & Mathias Weymar[2]
[1]University of Greifswald; [2]University of Potsdam
rico.fischer@uni-greifswald.de

Response conflicts play a prominent role in the flexible adaptation of behavior as they represent context-signals that indicate the necessity for the recruitment of cognitive control. Previous studies have highlighted the functional roles of the affectively aversive and arousing quality of the conflict signal in triggering the adaptation process. In this study we tested the causal impact of arousal on the behavioral and electrophysiological marker for adaptation to conflict. Participants performed a response conflict task in two separate sessions with either transcutaneous vagus nerve stimulation (tVNS) to directly modulate the arousal system or neutral sham stimulation. In both sessions the N2 and P3 event-related potentials (ERP) were assessed. In line with previous findings, conflict interference, the N2 and P3 amplitude were reduced after conflict. Most importantly, this adaptation to conflict was enhanced under tVNS compared to sham stimulation for conflict interference and the N2 amplitude. No effect of tVNS on the P3 component was found. Therefore, by proving a direct involvement of arousal in the adaptation to conflict, which may be linked to promoting activity of the locus coeruleus-norepinephrine system, the present findings add important pieces to the understanding of the neurophysiological mechanisms of conflict-triggered adjustment of cognitive control.

On the compositionality, timing and coordination of complex movements.

Tamar Flash
Weizmann Inst. of Science, Dept of CS and Applied Math, Weizmann Inst. of Science
tamar.flash@gmail.com

In my talk I will discuss several research directions taken to explore different principles underlying the construction and control of complex movements. One important topic is motor compositionality, examining the nature of the primitives underlying the construction of complex movements at different levels of the motor hierarchy. Another topic is motor timing, investigating the principles dictating the timing of complex motor behaviors regarding the durations of both different motion segments and the total movement durations. Finally the third topic to be discussed is motor coordination and the mapping between end-effector and joint motions for both upper limb and locomotion movements using various dimension reduction approaches. The mathematical models applied combine optimization models and geometrical approaches. Finally I will discuss open questions related to these approaches and future directions.

Capacity limitations of dishonesty

Anna Foerster, Robert Wirth, Wilfried Kunde & Roland Pfister
University of Würzburg, Department of Psychology III
anna.foerster@uni-wuerzburg.de

Unrehearsed dishonest responding entails an effortful two-step process of the inhibition of the automatically activated honest response and the generation of the dishonest response, even in the case of yes/no responses to simple questions. Two experiments examine the role of this two-step process in the stages of information processing. Together, the effect propagation logic and the locus-of-slack logic localized dishonest processes mostly in the central capacity-limited response selection stage but also in the late capacity-limited response monitoring stage. Surprisingly, dishonest responding also drew more strongly on perceptual processes than honest responding. The results demonstrate a pervasive impact of the two-step process in dishonest responding that mostly recruits capacity-limited resources. Moreover, the experiments point out a limitation of the underlying paradigm as the involved monitoring processes could overshadow potential motoric effects of dishonest responding.

Endogenous Cueing by Emotional Faces: Anticipatory Attentional Orienting Based on Visible and Masked Emotional Information

Timea Folyi, Michaela Rohr & Dirk Wentura
Saarland University, Department of Psychology
t.folyi@mx.uni-saarland.de

During endogenous cueing, centrally presented cues are utilized to direct attention to a designated peripheral target location. Simple cues are typically used in this paradigm, as the task-relevant information (e.g., color) and the associated spatial meaning (e.g., if color green – target appears right) need to be interpreted before attention allocation. We demonstrated that participants can initiate anticipatory attentional shifts based on the perceptually and semantically complex cue information carried by emotional facial expressions (e.g., joy emotion signals one target location and anger emotion the opposite target location). Cueing by emotional faces emerged remarkably fast, already at 300 ms cue-target asynchrony, both based on contrasting affective valence (i.e., joy vs. anger; Experiment 1) and specific negative emotions (e.g., sadness vs. fear; Experiment 2a,b,c). Moreover, even masked presented emotional faces could be utilized to control anticipatory attention, based on valence (Experiment 3) and also more differentiated emotional information (i.e., sadness vs. anger; Experiment 4). In a further experiment we tested the borders of the time course of the cueing effect. Results of Experiment 5 suggest that 150 ms cue-target asynchrony set a limit to endogenous cueing by emotional faces. Possible underlying mechanisms of cueing by emotional faces will be discussed.

Visual working memory biases attention in an involuntarily object-based manner: Evidence from visual search with varying targets

Rebecca M. Förster & Werner X. Schneider
Bielefeld University, Neurocognitive Psychology & Cognitive Interaction Technology Cluster of Excellence CITEC
rebecca.foerster@uni-bielefeld.de

Attentional biasing in visual search for varying targets requires that a target template is stored in visual working memory (VWM). It is unknown whether all or only search-relevant features of a VWM template bias attention during search. Notably, if VWM maintains objects in the form of bound features then all features will bias attention in an object-based manner, and biasing effects might be ranked by feature relevance. This was investigated in several visual search experiments. Within one experimental series relying on saccades, a cue varying in color and identity depicted the target prior to each search trial. Participants had to saccade to the target predefined by its identity only; color was irrelevant. Saccades went more often and faster to the target when it matched the cue not only in its target-defining identity but also in the irrelevant color. Moreover, cue-colored distractors captured the eyes more often than different-colored distractors, even if cue and target were never colored the same. Because participants were informed about the misleading color, this result argues against a strategical and voluntary usage of color. Instead, search-irrelevant features biased attention obligatorily arguing for the option of involuntary top-down control by object-based VWM templates.

Gaussian Process Modeling of Preferential Choice Dynamics

Mary Frame[1], Joseph Houpt[2] & Joseph Johnson[3]
[1]Wright State University, Wright State Research Institute; [2]Wright State University, Department of Psychology; [3]Miami University, Department of Psychology
mary.frame@wright.edu

Response dynamics is a robust process-tracing method that provides a window into continuously cascading cognition across a variety of domains, from linguistic processing to preferential decision making. With the increased popularity of movement tracking, several inferential statistical tests have been proposed, although most reduce the movement to a single value. Point values such as average absolute deviation and xflips are valuable, but lose the rich dynamics of individual trajectories. We employed a state of the art statistical analysis with Gaussian Process regression modeling to analyze mouse tracking data with a functional version of repeated measures ANOVA. With this method, we modeled full movement trajectories accounting for subject and condition. We applied this method to preferential choice data between gambles of varying riskiness from Koop & Johnson (2013) and data from an unpublished follow-up study testing similar basic preferential choices conducted with three different motion tracking input devices. By using Gaussian Process regression, we captured variation due to riskiness and device across full trajectories and more broadly demonstrated an approach for inferring differences across conditions.

Sensorimotor cues giving rise to independent learning of motor memories

David W. Franklin
Technical University of Munich, Department of Sport and Health Sciences
david.franklin@tum.de

The human sensorimotor control system has exceptional abilities to perform skilful action despite ever changing conditions. This occurs partially through the formation of independent motor memories: internal models that predict and compensate for the external environment. To perform tasks effectively our sensorimotor control system continuously updates the models of internal and external dynamics. Importantly we are able to switch from one task to another with no decrement in performance. Therefore a critical question in motor learning is what cues allow the formation and learning of a new independent motor memory. The effectiveness of these cues can be rigorously tested using an interference paradigm, where a participant attempts to learn opposing dynamics. No learning is possible without extra contextual information, therefore any learning can be attributed to the context. In a series of experiments using robotic systems, we have examined how past or future movements allow the independent learning of opposing dynamics. These results show that motor memories are encoded not simply as a mapping from current state to motor command but are encoded in terms of the history of sensorimotor states. Moreover we demonstrate that different sensory modalities exhibit district characteristics in terms of both learning and generalization.

The impact of cognitive control demands on subsequent memory performance

Michèle Friedli & Beat Meier
University of Bern, Experimental Psychology and Neuropsychology
michele.friedli@psy.unibe.ch

The purpose of this project is to investigate how cognitive control demands at encoding influence subsequent memory performance. This provides new insights into the cognitive control processes invoked by cognitive conflict. Towards this goal, we manipulate the amount and the type of conflict. For example, we use a task switching paradigm in a study phase in which the participants carry out two classification tasks on different stimuli. In a subsequent memory test, we compare performance for switch and repetition trials. The results show that in the study phase, switch stimuli produce performance costs. In the test phase, subsequent memory is typically lower for conflict stimuli (i.e. switch stimuli) compared to non-conflict stimuli (i.e. repeat stimuli). Here, higher cognitive control demands at encoding are associated with lower subsequent memory performance. However, the specific effects of conflict stimuli on memory performance depend on the type of conflict and also on the duration of the study-test interval. We introduce a new framework that account for the conflicting results reported in the literature.

Pimping Inhibition: anodal tDCS enhances stop-signal reaction time

Maximilian Achim Friehs & Christian Frings
University of Trier
friehs@uni-trier.de

The Stop-Signal Task (SST) is assumed to reliably measure response inhibition, specifically, in this task participants sometimes have to withhold a response according to the onset of a sudden cue. The response inhibition process is calculated via the Stop-Signal Reaction Time (SSRT; Verbruggen & Logan, 2009). The right dorsolateral prefrontal cortex (rDLPFC) plays a key role in goal directed cognitive control in general and particularly an increased activation has been associated with better SST performance, leading to shorter SSRT. We stimulated the rDLPFC in a pre-post design using a modified tDCS procedure compared to previous studies. A 9 cm^2 anode was always positioned over the rDLPFC while the 35 cm^2 cathode was placed over the left deltoid. We contrasted an anodal stimulation condition with sham stimulation and expected an increase in performance after anodal tDCS, as evidenced by a decrease in SSRT. In a sample of N = 57 healthy adults, we found a significant time x tDCS-condition interaction in the expected direction. Control analysis confirmed that the statistically significant decrease in SSRT after anodal tDCS was not due to generally faster reaction times. These results show that anodal tDCS applied to the rDLPFC can modulate cognitive inhibition processes.

How sequential changes in reward expectation modulate cognitive control: pupillometry as a tool to monitor dynamic changes in reward expectation

Kerstin Fröber[1], Ferdinand Pittino[2] & Gesine Dreisbach[1]
[1]University of Regensburg, Experimental Psychology; [2]University of Ulm, Experimental Psychology
kerstin.froeber@ur.de

Much evidence suggests that performance contingent reward modulates cognitive flexibility and stability. For example, in voluntary task switching, it has been shown that unchanged high reward promotes cognitive stability whereas increases or decreases in reward prospect promote cognitive flexibility (higher voluntary switch rate, VSR). Pupil diameter has been shown to respond to reward prospect as well as task switching manipulations and thus appears to be the ideal tool to learn more about the processes underlying these reward-modulated decisions. Therefore, we measured the pupil dilation in a voluntary task switching experiment with randomly changing reward magnitudes. Again, VSR was lowest when reward remained high, intermediate when reward remained low, and highest when reward increased or decreased. Pupil diameter was generally higher in switch trials as compared to repetition trials. More importantly, the pupil responded dynamically to the reward manipulation: the pupil dilation was larger in high than in low reward trials, and the phasic dilation after a reward cue was highest when reward prospect increased and lowest when reward prospect decreased. Therefore, pupil diameter seems to be a useful tool to monitor dynamic changes in reward expectation and effort exertion.

Recognizing emotions from normal and from whispered voices

Sascha Frühholz
University of Zurich, Department of Psychology
sascha.fruehholz@uzh.ch

Whispered vocalizations have an extremely impoverished acoustic quality, thus imposing a challenge to the human neural system to accurately perceive emotions expressed in these voices. I present new data about how the neural system recognizes emotions from normal and from whispered vocalizations while we recorded brain activity in human listeners using functional magnetic resonance imaging (fMRI). Our data show, first, that emotions from normal voices are decoded in regions of the auditory cortex that mainly decode spectral voice information based on the salient pitch information in normal voices. Second, emotions from whispered voices are decoded in a compensatory neural network largely outside the core auditory system in frontal brain regions and in higher-level auditory regions that mainly decode temporal voice information as the only available information in whispered voices. Third, a connectivity analysis demonstrates that recognizing emotions from whispered voices requires information exchange in a complex and large-scale neural network. Fourth, I will quickly compare the brain data with our recently developed computer algorithms that were trained to decode emotions from whispered voices. Taken together, emotions can be recognized from whispered voices, although less accurate and only at the costs of considerably neural and computational compensation mechanisms.

Active tactile search strategies improve localization of touch

Xaver Fuchs & Tobias Heed
Bielefeld University, Faculty of Psychology & Sports Science
xaver.fuchs@uni-bielefeld.de

Visual localization often uses a two-step strategy: Gaze is first directed from far away to near the target; a second saccade then uses online visual information to correct the remaining error. We tested whether tactile localization with a hand uses a similar strategy. Here, variability can arise from tactile, proprioceptive and motor systems. For a movement towards touch, the 2D skin target location must be converted into a 3D target location for the finger. Tactile search strategies based on online tactile information might compensate for inaccuracy of initial goal-directed movements to touch. Participants received a brief touch on their forearm with their eyes closed. They first touched the target location and were allowed to then correct the indicated location by moving the finger on the arm. We observed different search strategies. Most search paths were directed towards the correct target location. However, some participants regularly explored seemingly random directions. Even this random search improved localization. Thus, the tactile system resembles vision, in that an initial target representation appears to provide only coarse resolution and guides a first motor response; the final target location is then assessed in a second step through online use of sensory information.

Objective Measurement and Prediction of Processing Capacity

Isabella Fuchs-Leitner, Lisa Falschlunger & Othmar Lehner
University of Applied Sciences Upper Austria
isabella.fuchs-leitner@fh-steyr.at

The objective measurement and prediction of processing load and processing capacity during a specific task is still one major aim in vision research. We set out to exploit a very well controlled setting: an everyday working place scenario, in which the participants had to complete tasks involving visualized data on a computer screen. In a prior experiment, we analysed eye movement measures and subjective judgments on cognitive effort within a structural equation model, yet were unable to find clear evidence whether high levels of working memory span reduce cognitive load. Here we thus readdress this hypothesis within the framework of Lavie's load theory of selective attention and cognitive control to distinguish between the specific effects of perceptual and cognitive loads. In the current experiment, we recorded eye movements during conditions of varying perceptual load (low vs. high) while controlling for working memory load. Eye movement variables as well as scan path characteristics were analysed. Based on the findings, we discuss the adequacy of the predefined eye movement measures as objective measurements for processing capacity during visual tasks and elaborate on their predictive power potential.

Simon says, do not turn by 90 degrees - investigating the impact of stimulus material, stimulus orientation and inner speech habits on the Simon effect

Miriam Gade[1], Michel D Druey[2] & Marko Paelecke[3]
[1]Katholische Universität Eichstätt-Ingolstadt; [2]University of Konstanz; [3]University of Würzburg
miriam.gade@ku.de

In Simon-type interference tasks, participants are asked to perform a two-choice reaction on a stimulus dimension (e.g. color) while ignoring the stimulus position. Commonly robust compatibility effects are found, i.e. faster reactions when the relevant stimulus attribute and the assigned response match the location of the stimulus. Simon effects are regularly attributed to a fast, non-verbal processing route. To examine the stability of this effect and the assumed dominance of the fast, non-verbal processing route, we manipulated stimulus material (gratings vs. words) as well as orientation (horizontal vs. vertical). Results of our first experiment point to a malleability of the Simon effects by both factors, up to an inversion of classical Simon effect for vertically oriented words. In further experiments, we could rule out strategic modulations and replicate the inversed effect. One cause for this inversion might be the habitual use of inner speech for self-instruction that overrides the automatic processing route. Therefore, we assessed individual differences in inner speech habits. We analyzed the data with multilevel analysis simultaneously taking into account personality as well as performance measures.

Reading at the speed of speech: Visual language perception at ~5 Hz

Benjamin Gagl[1], Julius Golch[2], Stefan Hawelka[3], Jona Sassenhagen[2], David Poeppel[4] & Christian J. Fiebach[5]
[1]Department of Psychology, Goethe University Frankfurt; Center for Individual Development and Adaptive Education of Children at Risk (IDeA); [2]Department of Psychology, Goethe University Frankfurt; [3]Centre for Cognitive Neuroscience, University of Salzburg; [4]Max Planck Institute for Empirical Aesthetics; Department of Psychology, New York University; [5]Department of Psychology, Goethe University Frankfurt; Center for Individual Development and Adaptive Education of Children at Risk (IDeA); Max Planck Institute for Empirical Aesthetics
gagl@psych.uni-frankfurt.de

Across languages, the speech signal is characterized by an ~5 Hz rhythm (range: 4.3 - 5.4) of the amplitude modulation spectrum, reflecting the processing of linguistic information chunks at on average every 200 ms. Interestingly, this is also the typical eye-fixation duration during reading. Prompted by this observation, we estimated the sampling frequency at which the eyes sample text (i.e., the eye-movement sampling frequency) for German speakers, and demonstrate that they read sentences at a rate of ~5 Hz (range 3.9-6 Hz for a sample of 50 readers). We then conducted a meta-analysis (90 studies) to examine the generality of this finding. The meta-analysis replicates a 5 Hz sampling rate in German. Across different languages, however, the fixation-based sampling frequency varied between 3.8-5.4 Hz (mean: 4.5 Hz), with a systematic reduction from easy to difficult (e.g., in terms of letter-to-sound conversion rules) writing systems. These results demonstrate a remarkable temporal alignment between reading and speech processing in easy-to-process writing systems. We propose that language systems tuned to speech perception drive voluntary eye movements in reading, to supply information to linguistic processes at an optimal uptake rate.

Information use in intertemporal choice: Visual feedback alleviates melioration

Felix Gaisbauer & Hansjörg Neth
Universität Konstanz, Department of Psychology
felix.gaisbauer@uni-konstanz.de

Should I have another drink now and risk a worse hangover tomorrow? Should I spend my money on this item or rather save it for retirement? When the consequences of decisions yield conflicting rewards over time, humans frequently fail to choose the best global option in the presence of a locally more attractive, but globally inferior option — a preference known as melioration. Melioration has been demonstrated to persist across a range of experimental set-ups, even including normative, prospective feedback on optimal performance. In a between-subjects experiment, we demonstrate that a simple environment that renders rewards contingent upon as few as the last three trials can induce a well-studied finding of intertemporal choice: Whereas participants in a condition with deterministic rewards learn to identify and exploit a globally superior option (maximization), participants in a condition with probabilistic rewards tend to settle at stable suboptimal performance (melioration). In a second experiment, we mirror participants' choices and rewards of their last three trials. Using the same (deterministic vs. probabilistic) manipulation of the reward scheme, participants now mostly approach maximization in both conditions. Thus, some forms of visual feedback support participants in forming adequate representations to overcome melioration in intertemporal choice.

Priming of Grasp Affordance in an Ambiguous Object

Patricia Garrido-Vásquez[1], Eileen Wengemuth[2] & Anna Schubö[2]
[1]Department of Experimental Psychology and Cognitive Science, Justus Liebig University Giessen; [2]Cognitive Neuroscience of Perception and Action, Experimental and Biological Psychology, Philipps University Marburg
pgarridovas@gmail.com

Object affordance refers to possibilities of interaction with objects in our environment, for example grasping. Previous research shows that affording objects activate the motor system and attract attention. The present study relates electrophysiology to overt motor behavior in the context of object affordance. An ambiguous target (an elongated wooden object) was primed either with an affording (pencils) or non-affording (trees) context, and we measured event-related potentials and grasping behavior in response to the target. Despite being physically identical across both conditions, the target elicited an enhanced posterior P1 component in the affording condition. This indicates that more attention was drawn to it. The posterior N1 component was reduced by the affording context, potentially related to the processing of action properties of objects. We also observed an enhanced frontal negativity for the target in the affording context, which has previously been related to activation of the brain's motor system by tools. Moreover, priming influenced motor behavior directly: grip aperture in response to the target was larger when trees rather than pencils had been primed. Thus, our findings indicate that an ambiguous object primed with an affording context may acquire grasp affordance and directly affect motor behavior.

A two-factor model of the visual complexity of abstract patterns

Andreas Gartus & Helmut Leder
University of Vienna, Department of Basic Psychological Research and Research Methods
andreas.gartus@univie.ac.at

The quantification of visual complexity is relevant for many areas of research like usability engineering or empirical aesthetics. Therefore, many attempts have been made to derive measures of complexity from objective image properties. It has been argued that visual complexity is a multidimensional construct consisting of at least two dimensions: A quantitative dimension increasing complexity and a structural, order-related dimension setting an upper bound on complexity. In this work, we studied human complexity perception using two independent sets of abstract black-and-white patterns. A range of computational measures of complexity was calculated from the patterns and combined using linear regression and machine learning to predict human evaluations of image complexity. Our results confirm two-factor models of perceived visual complexity consisting of a quantitative and a structural factor (mirror symmetry) for both of our stimulus sets. Furthermore, a non-linear transformation of the structural factor giving more influence to small deviations from symmetry greatly increased explained variance in one of the two stimulus sets. In sum, we demonstrate the multidimensional nature of human complexity perception and present a comprehensive quantitative model of visual complexity of abstract black-and-white patterns. Similar models of visual complexity might be useful in future applications.

Dual task performance reflects sequence learning-based prediction

Robert Gaschler[1], Fang Zhao[1], Eva Röttger[2] & Hilde Haider[2]
[1]Department of Psychology, FernUniversität in Hagen; [2]Department of Psychology, Universität zu Köln
robert.gaschler@fernuni-hagen.de

Past work suggests that sequence learning is compromised by dual tasking, because participants use regularly sequenced stimuli and responses of the sequence learning task as well as the randomly sequenced events in the other task to predict upcoming trials. Here we report an experiment (N=21) which offers a means to track prediction in dual tasking when participants have acquired sequence knowledge beforehand. During single task sequence learning blocks, participants reacted to the position of a shape (6 horizontal positions, 6 keys) which followed a first order repeating sequence. In the following dual task blocks, a second shape was added (randomly while sparing the location occupied by the repeating sequence). Participants now had to respond to two positions in each trial. RTs differed substantially for the two shapes, suggesting that participants indeed distinguished the shapes. More importantly, RTs for both shapes were influenced by whether the current randomly placed shape occupied a position that would be occupied in the regular repeating sequence at upcoming trial n+1 or trial n+2.

Assimilation and Contrast in Evaluative Conditioning and Moral Judgments - An Ecological Perspective

Anne Gast[1], Fabia Högden[1], Christian Unkelbach[1], Adam Galinsky[2] & Joris Lammers[1]
[1]University of Cologne; [2]University of Columbia
anne.gast@uni-koeln.de

In evaluative conditioning the neutral CS usually changes its valence into the direction of the US it was paired with. Evaluative conditioning effects are thus typically assimilative in nature. We argue that this assimilative dominance might by due to a property of most stimulus ecologies: positive information is more likely to occur with positive information than with negative information and negative information is more likely to occur with negative information. We tested this hypothesis in a preregistered experiment (N = 200), in which we manipulated the evaluative consistency of the context in which CS-US pairs were presented. These contexts either had a "normal ecology" or a "reversed ecology", in which positive stimuli were more likely to co-occur with negative stimuli and vice versa. We found that the evaluative conditioning effect was moderated by this manipulation. While standard EC effects were found in the normal ecology condition, this effect was reduced in the reversed ecology. In a related series of studies, we found an analogous effect on moral judgments. Moral character inferences based on behavioral information were stronger in normal than in reversed contexts. We discuss potentially underlying cognitive processes, as well as the relevance and limitations of the findings.

Bewertung kritischer Verkehrssituationen während einer vollautomatisierten Fahrt

Leonie Gauer
Katholische Universität Eichstätt-Ingolstadt, Allgemeine Psychologie II
Leonie.Gauer@audi.de

Die Rolle des Fahrers wandelt sich mit wachsender Fahrzeugautomation. So wird der Nutzer eines Fahrzeugs vom aktiv beteiligten Akteur zum Überwacher eines teilautomatisierten Systems. Er nimmt so die Rolle des Beifahrers ein. Während der vollautomatisierten Fahrt übergibt er seine Fahraufgabe gänzlich an das System und wird damit zum Passagier. Um den Nutzer an seine Rolle heranzuführen muss die Informationsgestaltung auf dessen Bedürfnisse abgestimmt werden. Dazu müssen zunächst automatisierte Fahrmanöver identifiziert werden, die sich zum Abbilden typischer Verkehrssituationen im experimentellen Setting eignen und neue Fahrfunktionen erlebbar machen. Um dies zu erreichen ist eine Realfahrzeugstudie geplant, dessen Ergebnisse in diesem Beitrag veröffentlicht werden sollen. Die Versuchsteilnehmer werden wiederholt als Beifahrer automatisiert durch einen Parcours mit verschiedenen Verkehrssituationen gefahren. Dabei wird die jeweilige Rolle variiert, indem der Fahrersitz während der Fahrt besetzt wird (TN= Beifahrer) oder frei bleibt (TN= Mitfahrer). Nach jeder Situation bewerten die Probanden die wahrgenommene Kritikalität der Situation. Zusätzlich werden Blickbewegungen und Situationen erfasst, die als besonders unangenehm bewertet werden. Durch die Ergebnisse sollen Fahrsituationen abgeleitet werden, die die Analyse des Informationsbedarfes während vollautomatisierter Fahrten in Realfahrtstudien ermöglichen.

Can handwriting improve reasoning performance?

Lupita Estefania Gazzo Castaneda, Regina E Fabry & Markus Knauff
University of Giessen, Experimental Psychology and Cognitive Science
estefania.gazzo@psychol.uni-giessen.de

The belief bias describes people's tendency to reason in accordance with background beliefs, even when they are in conflict with an argument's logical validity. We investigated whether handwriting can help overcome this bias. Initial experimental evidence suggests that experts can benefit from handwriting, because they can apply their skills in operating with logical notations. The question arises whether laypeople can also benefit from handwriting. To investigate this question, we presented syllogisms to laypeople. The content of the syllogisms and the validity of the conclusion were either congruent or incongruent. Participants were asked to judge whether the conclusion follows logically from the premises. Only in half of these tasks participants had the opportunity to use pen and paper to take down notes. Results show that laypeople did not benefit from this opportunity. Rather, their performance deteriorated in the pen-and-paper condition. Furthermore, only performance in the non-paper-and-pencil condition was dependent on working memory, but not the performance in the paper-and-pencil condition. Our results suggest that handwriting has an influence on reasoning performance that goes beyond offloading information from working memory onto paper. We discuss these results from the perspective of research on enculturation and distributed cognition.

How the fine-motor skills of 9-month-old infants influence their predictive grasping behavior

Gloria Gehb, Claudia Kubicek, Bianca Jovanovic & Gudrun Schwarzer
Justus-Liebig-University, Developmental Psychology
gloria.gehb@psychol.uni-giessen.de

Several studies have shown that fine-motor experiences facilitate the development of cognitive abilities (for an overview see: Schwarzer, 2014). For instance, fine motor skills are related to visual prediction abilities in 7-month-old infants (Kubicek, Jovanovic, & Schwarzer, 2017). However, predictive reaching for a moving object seems to be more difficult than just looking at the correct location (e.g. van der Meer, van der Weel, & Lee, 1994). The goal of the present study was to investigate whether manual exploration skills are related to the ability to predictively grasp for moving and partly occluded objects. Our sample consisted of 34 9-month-old infants. One task was designed to test infants' manual exploration skills. In the second task, the infants were required to reach for and grasp temporarily covered targets attached to an object that was moving 90 ° around its horizontal axis. We recorded infants' grasping movements with a video camera and a Vicon motion capture system. Our results indicate a relationship between the extent to which infants were able to grasp predictively and their frequency of one specific manual exploration procedure (fingering).

Visual preference for real objects over pictures is related to 7-month-old infants' manual object exploration

Theresa M Gerhard[1], Jody C Culham[2] & Gudrun Schwarzer[1]
[1]Justus-Liebig-University, Developmental Psychology; [2]University of Western Ontario, Department of Psychology and Brain and Mind Institute
theresa.gerhard@psychol.uni-giessen.de

Previous research showed that infants prefer to look at real objects over corresponding pictures when presented with them simultaneously (e.g., Gerhard, Culham, & Schwarzer, 2016). Furthermore, sophisticated manual exploration skills such as fingering, rotating, and transferring objects were found to foster infants' understanding about the three-dimensional nature of objects (Soska, Adolph, & Johnson, 2010). Therefore, it was the primary goal of the present study to examine whether 7-month-old infants' visual preference for real objects and corresponding pictures is related to their manual object exploration behavior. By using a preferential looking paradigm, we presented 59 7-month-old infants with a real toy next to its picture version. All of the infants also participated in a manual object exploration task. Results showed a preference for real objects that was dependent on infants' manual object exploration. Infants with a high score in fingerings preferred to look at the real objects, whereas infants with a low score in fingerings showed no preferences. Our findings replicate previous work on a preference for real objects over pictures in infants (Gerhard et al., 2016). Moreover, they suggest that experience with specific exploratory actions might improve infants' understanding of the differences in form regarding real objects and pictures.

Social influence can lead to a persistent perceptual bias

Markus Germar
University of Hildesheim, Institute of Psychology
germar@uni-hildesheim.de

Since the classic studies by Sherif (1935), Asch (1956), and Moscovici and Personnaz (1980), one of the most fundamental questions in social psychology is whether social influence can alter basic perceptual processes. Recent research shows that social influence can indeed induce a perceptual bias. More precisely, these studies demonstrate that others' decisions about a stimulus can alter the uptake of available sensory information (Germar, Schlemmer, Krug, Voss, & Mojzisch, 2014; Germar, Albrecht, Voss, & Mojzisch, 2016). However, it remains unclear whether social influence can have a lasting effect on perceptual decision-making, thus, whether the perceptual bias persists after being exposed to social influence. To address this issue, we conducted two experiments (N = 160) in which participants completed a perceptual task split in two phases. In the first phase, they received feedback about other participants' decisions. In the second phase, they completed the task alone. We conducted a diffusion model analysis (Ratcliff, 1978) of the reaction time data of the second phase in order to disentangle whether social influence leads to a persistent perceptual and/or judgmental bias. Our findings consistently show that social influence can lead to a lasting change in perceptual decision-making due to a persistent perceptual bias.

From hammers to numbers: The role of experience and expertise in shaping concrete and abstract concepts

Marta Virginia Ghio & Christian Bellebaum
Heinrich-Heine University, Institute of Experimental Psychology
marta.ghio@hhu.de

According to grounded theories of semantic memory, the involvement of distributed networks including modality-specific brain systems (e.g., sensory-motor, emotional) in conceptual processing reflects the type of experiential information that is relevant during concept acquisition. Direct evidence of the role of experience in shaping conceptual representations, however, is still sparse, especially for abstract concepts. An experimental approach to address experience dependence for concrete concepts is to test in healthy participants whether the type of experience (action vs. visual) during concept acquisition or the degree of action expertise affects the semantic processing of words referring to tools (e.g., hammer) or actions (e.g., to grasp). To this purpose, we developed training-based paradigms, which allowed to experimentally control the individual experience and familiarity with either novel objects or specific actions and action concepts. We applied these paradigms in a series of studies employing electroencephalography, (functional) magnetic resonance imaging and voxel based morphometry. In addition, we extend previous research on the effects of individual experience on conceptual processing to the abstract domain by focusing on mathematical concepts (e.g., arithmetic). Preliminary findings suggest that the level of expertise (experts vs. novices) with mathematical concepts specifically affects the processing of mathematical compared to other abstract words.

Intimate co-representation for action regulation: Retrieval of observationally acquired stimulus-response bindings in romantically involved interaction partners versus strangers

Carina Giesen[1], Virginia Löhl[2] & Nicolas Koranyi[2]
[1]Department of Psychology, General Psychology II, Friedrich Schiller University Jena; [2]Friedrich Schiller University Jena
carina.giesen@uni-jena.de

Social dependence in a task modulates binding and retrieval of stimuli and observed responses (Giesen, Herrmann & Rothermund, 2014): Stimulus-based retrieval of observed responses occurred only if the task required pairs to work cooperatively or competitively, but not if pairs worked independently. The present study investigated retrieval of observational SR bindings in romantically involved couples versus pairs of strangers. We assumed that romantically involved individuals would more closely represent their own and their partner's actions and would do so irrespective of task requirements. A sequential prime-probe design was shared between two co-actors who took the roles of actor and observer in turns. Stimulus relation and compatibility between observed (prime) and to-be-performed (probe) responses were varied orthogonally within participants. All participants were in a romantic relationship; half of all pairs performed the task with their romantic partner, the rest worked with a stranger. As expected, stimulus-based retrieval of observationally acquired SR-bindings occurred only in romantically involved pairs; prime observers interacting with a stranger showed no retrieval effects. We conclude that mental representations of self and other are more closely intertwined in romantic couples, which produces automatic action co-representation effects even if co-representation is not required by the task itself.

Utility dependent processing of distractor information and reduction of distractor interference over time

Imke Marilla Gillich[1], Mike Wendt[2] & Thomas Jacobsen[1]
[1]Helmut Schmidt University/University of the Federal Armed Forces Hamburg; [2]Medical School Hamburg
gillichi@hsu-hh.de

Interference evoked by a distractor presented in advance of the target is reduced when the distractor-target SOA is increased, suggesting timing-related inhibition of distractor-related activation. In addition, distractor processing is assumed to be (strategically) adjusted to the proportions of congruent and incongruent target-distractor combinations. To explore the interplay of proportion congruency-based adjustment and the time course of distractor-related activation, we varied the proportions of congruent and incongruent trials as well as the distractor-target SOA. To control for a confound due to item-specific priming, we kept distractor-related contingencies constant for a subset of the stimuli, and used a different subset to bias the proportions of congruent and incongruent trials. Distractor interference was larger, for both sets of stimuli, when proportion of congruent trials was high, dismissing accounts of item-specific priming, and reduced when the SOA was long, showing no evidence for maintenance of distractor-related activation under conditions of strategic distractor usage.

Visuospatial attention shifts during mental arithmetic can be measured via a temporal order judgment task

Maria Glaser & André Knops
Humboldt-Universität zu Berlin, Department of Psychology
maria.glaser@hu-berlin.de

Previous research has revealed a strong relationship between numbers and space. In the context of arithmetic processing, it has been shown that solving addition problems shifts attention to the right and solving subtraction problems shifts attention to the left. However, it is still unclear at what point during the arithmetic process these spatial attention shifts occur. To address this question, the present study made use of a temporal order judgement task (TOJ) where participants needed to decide which of two lateralized stimuli was presented first. The experiment was made of two blocks: a baseline TOJ block and an arithmetic TOJ block. In the second block participants were presented with two-digit addition and subtraction problems via headphones. After a varying delay (500, 1000 & 1500 ms) participants performed the TOJ task and then reported the result of the arithmetic task presented beforehand. Consistent with previous findings, addition/subtraction tasks induced attentional shifts to the right/left. More importantly, the results indicated that these shifts become more likely after larger delays. This suggests that visuospatial attention mechanisms are recruited during mental arithmetic, especially during the advanced calculation stages, and that mental arithmetic is performed on a numerical representation that is spatially oriented.

Moderators of lateral attitude change

Tina Glaser, Katrin Pum, Roman Linne, Lea Elleringmann & Gerd Bohner
University of Bielefeld, Department of Psychology
tina.glaser@uni-bielefeld.de

In two studies, we tested basic assumptions of the lateral attitude change (LAC) model (Glaser et al., 2015) in which generalization describes a change in evaluation in a focal object and in lateral objects, whereas displacement describes explicit attitude change only on lateral but not on focal objects. In Study 1, we found that valenced information about products did not only lead to attitude change toward the focal product but also generalized to similar (= lateral) products on explicit as well as implicit measures. Discrediting the product information resulted in a smaller explicit focal change but did not influence implicit evaluations. Additionally, Study 1 revealed that generalization is a linear function of strength of association between focal and lateral stimuli. In Study 2, we used only explicit measures and additionally manipulated preference for consistency. We replicated focal attitude change and generalization effects. Moreover, in the condition where product information was discredited, a displacement effect emerged for one of the products. Preference for consistency did not significantly moderate the LAC effects; however, a descriptive trend showed that high (vs. low) preference for consistency led to stronger explicit generalization effects.

Perceptual reliability in the scotopic foveal scotoma

Alejandro Hernán Gloriani & Alexander C Schütz
Philipps-University Marburg, Psychology Department-Sensomotoric learning
alejandro.gloriani@staff.uni-marburg.de

In order to optimize their responses, humans need assess the received sensory information. Sometimes, however, percepts are inferred only from the context and therefore intrinsically uncertain. Here we investigate if percepts in the scotopic foveal scotoma could be biased by a surrounding stimulus and the integration of the information across saccades in this condition of low luminance. Striped stimuli either vertical or horizontal were presented in a presaccadic peripheral, postsaccadic foveal and trans-saccadic integration discrimination task. In order to perform the stimulation, we used a striped annulus concentric with a striped inner circle. In some trials only the inner circle was presented, and in those trials in which both stimuli were presented simultaneously, the striped patterns could be either parallel or orthogonal. Participants always judged the orientation of the inner circle. We calculated the d-primes and bias values for the different stimulation conditions and we found that the perception in the foveal scotoma is clearly biased for the surround. Furthermore, we found that the performance during the trans-saccadic discrimination task is better than the performances for the other conditions, suggesting the integration of peripheral and foveal information even in the scotopic range, in which cone photoreceptors are not active.

Leave-One-Trial-Out (LOTO): A very simple and very general method to capture trial-by-trial variability in cognitive model parameters

Sebastian Gluth & Nachshon Meiran
University of Basel, Department of Psychology
sebastian.gluth@unibas.ch

The remarkable success of model-based cognitive neuroscience in recent years has been accompanied by an increased interest in understanding trial-by-trial fluctuations of parameters of cognitive models (for relating these fluctuations to brain activity). Yet, previous attempts of capturing parameter variability were limited by being restricted to specific models, by being difficult to implement, or by requiring a high amount of computation time. We propose a simple, efficient and general approach to estimating trial-wise changes in latent variables: Leave-One-Trial-Out (LOTO). The basic principle of LOTO is to estimate parameter values for the complete dataset and for the dataset with a specific trial being omitted. The difference in the estimates is then a reflection of the parameter value in the omitted trial. This method is superior to estimating parameter values from single trials directly, and faster than our previously developed Bayesian approach. We will demonstrate the generality of LOTO by applying it to different cognitive models using both choice and response time data. Altogether, LOTO has the potential to promote research on tracking changes in cognitive model parameters and linking these changes to neuroscientific measures.

Prediction in the oculomotor system

Alexander Goettker[1], Doris I Braun[2], Alexander C Schütz[3] & Karl R Gegenfurtner[2]
[1]Justus-Liebig University, Experimental Psychology; [2]Justus-Liebig University Giessen, Experimental Psychology; [3]Philipps-University Marburg, Sensomotoric learning
Alexander.Goettker@psychol.uni-giessen.de

Due to the foveal organization of our visual system we have to constantly move our eyes to gain precise information about our environment. However, doing so massively alters the retinal input. This is problematic for the perception of moving objects, because physical motion and retinal motion become decoupled and the brain has to discount for the eye movements to recover the speed of moving objects. Thus, during following of moving objects the role of prediction is twofold. First, due the internal processing delays there is the need for continuous predictions about future locations of the target to enable the oculomotor system to keep track of it. Second, predictions have to be made about the effect of ongoing eye movements on the retinal input, in order to reconstruct the actual state of the environment. To tap into those questions we investigated how different target movements affect the oculomotor behavior and how different oculomotor behavior affects the perceived speed of a target. We found that our eye movements, saccades and smooth pursuit, are influenced and react to the position and the speed of moving target and that differences in oculomotor behavior, especially the use of corrective saccades, can affect perceived speed.

Bewahrt das Linksabbiegen an T-Kreuzungen den Pkw-Fahrer vor Kollisionen mit querenden Radfahrern von rechts? Eine sicherheitskritische Bewertung des Blick- und Annäherungsverhaltens von rechts- und linksabbiegenden Pkw-Fahrern

Irene Gohl
Universität der Bundeswehr München, Institut für Arbeitswissenschaft
extern.irene.gohl@audi.de

Die Betrachtung des Unfallgeschehens an T-Kreuzungen zwischen einem einbiegenden Fahrzeug und einem von rechts auf dem Radweg querenden Radfahrer zeigt, dass rechtsabbiegende Pkw-Fahrer häufiger mit Radfahrern von rechts kollidieren als linksabbiegende Pkw-Fahrer. Frühere Untersuchungen zeigten, dass rechts- und linksabbiegende Pkw-Fahrer ein räumlich unterschiedliches Blickverhalten aufweisen. Da die Pkw-Fahrer bis zu einem bestimmten Zeitpunkt auch auf kurzfristige Änderungen in der Peripherie noch rechtzeitig reagieren können, kann das Blickverhalten beim Rechtsabbiegen nicht per se als sicherheitskritischer für Radfahrer von rechts erachtet werden als beim Linksabbiegen. Entscheidend für die Bewertung eines sicherheitskritischen Verhaltens ist vielmehr wie gut die mentale Repräsentation der Umwelt unmittelbar vor diesem Zeitpunkt mit der aktuellen Situation übereinstimmt. Aus diesem Grund wurde eine Fahrversuchsstudie mit 48 Probanden im realen Straßenverkehr durchgeführt. Da die Güte des mentalen Abbildes einerseits durch das Blickverhalten und andererseits durch das nutzbare Sichtfeld des Verkehrsraumes beeinflusst wird, wurde das Fahrerverhalten an vier T-Kreuzungen mit unterschiedlichen Einsehbarkeiten untersucht. Die Ergebnisse zeigen, dass rechts- und linksabbiegende Pkw-Fahrer ein ähnlich hohes Risiko in Kauf nehmen nicht mehr rechtzeitig auf eine kurzfristige Änderung der Situation reagieren zu können. Ferner unterscheidet sich das Blickverhalten unmittelbar vor dem letztmöglichen Eingriffszeitpunkt nicht signifikant in Abhängigkeit des Abbiegemanövers und/oder der Einsehbarkeit.

I spy with my little eye: About features that capture the attention of Korean speakers but not of German speakers

Florian Goller[1], Soonja Choi[2] & Ulrich Ansorge[1]
[1]University of Vienna, Department of Basic Psychological Research and Research Methods; [2]San Diego State University, Department of Linguistics and Asian/Middle-Eastern Languages; University of Vienna, Faculty of Philological and Cultural Studies
florian.goller@univie.ac.at

We present an experimental paradigm that provides an excellent method to answer not only whether language influences our perception and cognition, but also how deeply it can influence them. We tested native speakers of Korean and German, two languages that semantically categorize spatial relations in fundamentally different ways: German (similar to English) categorizes spatial relations based on containment (in) and support (auf), whereas Korean categorizes by – and thus semantically distinguish between - tight-fit (kkita) vs. loose-fit (nehta, nohta). Using a visual search paradigm, we tested whether the language that participants speak makes them more or less sensitive to such features of visual stimuli. We let Korean and German speakers search for a predefined colour target among distractors. Unbeknownst to the participants, targets were also implicitly signalled by features of a different sematic domain, i.e. spatial relations of tight-fit or loose-fit. We found that only Koreans spontaneously picked up on this implicit feature of spatial fitness and used it to aid their search for colour. As these spatial concepts are not grammticalised in the German language, our results demonstrate that there is an influence of language-specific semantics of the native language on very basic processes of visual attention.

Predicting value-based decisions using a memory model

Tamara Gomilsek, Wolfgang Gaissmaier & Janina Anna Hoffmann
University of Konstanz, Department for Psychology
tamara.gomilsek@uni-konstanz.de

Value-based decisions are mostly portrayed as a weighing of attributes, although daily decisions, such as evaluating food, may often entail an associative retrieval of prior judgments. Indeed, prior work suggests that factors strengthening or inhibiting retrieval of previous judgments, such as the frequency of exposure, systematically affect value-based decisions. The current work aims to predict value-based decisions with a memory model that bases value-based choices solely on the similarity of the current probe to previously seen exemplars. A simulation study showed that people should prefer more frequent items to less frequent items and items with higher values to items with lower values. Importantly, the memory model proposes that people should more strongly prefer frequently presented items that have higher values. We test these predictions in an experiment that varies the frequency of presented items and their item values in the learning stage. In the subsequent decision phase, participants had to repeatedly choose between two items with reward depending completely on their choices. As predicted in the simulation study, first results of an experiment show that people really do prefer frequent items with higher values in comparison to less frequent items with lower values.

Drifting through the Noise – A diffusion model analysis of the interplay between processing and storage in working memory

Jan Göttmann, Alexander Kipnis, Gidon T. Frischkorn & Anna-Lena Schubert
Ruprecht-Karls Universität, Institute of Psychology
j.goettmann@stud.uni-heidelberg.de

This study examined the interrelations between processing and storage in working memory. We developed an experimental design in which the updating process of the central executive can be manipulated separately from memory load. Further, we explored which parameter of the Ratcliff Diffusion Model captures the effects of updating and memory load on working memory performance best. The results showed main and interaction effects of memory set size and updating on both accuracy (Acc) and reaction time (RT) during memory retrieval. To test whether the effects on RT and Acc were related to differences in the drift parameter v, we compared different specifications of the Ratcliff Diffusion Model. Overall, the model which only varied the drift rate over experimental conditions explained the empirical data best and most parsimoniously. Additionally, an out of sample prediction from half of the data was conducted to further validate the model selection. We thus conclude that drift rate may be interpreted as an indicator for the signal to noise ratio in working memory and is a valid predictor for working memory performance. Furthermore, the results indicate that memory load and updating access a common cognitive resource in working memory.

Effects of vertical head orientation on spatial attention

Felix J. Götz, Anne Böckler, Paul M. Heineck & Andreas B. Eder
Julius-Maximilians-Universität Würzburg, Department of Psychology
goetzfj@gmail.com

Social cognition research showed that another person's gaze direction and/or head orientation can cause shifts of visual spatial attention. The present studies aimed at disentangling gaze and head orientation. Specifically, portrait-like photographs from a frontal view with gaze directed at the camera but head tilted up vs. down (vs. not tilted) were used as facial cue stimuli. In all three experiments, participants had to identify vertically presented shapes (circle or square) that followed facial cue stimuli. We hypothesized that target identification is faster if direction of head tilt and target location correspond. In Experiment 1, static photographs of heads tilted up vs. down affected identification times according to our hypothesis. In Experiment 2, photographs with heads not tilted preceded photographs with tilted heads to simulate a dynamic head movement. Again, identification times were affected in line with our hypothesis. In Experiment 3, photographs with heads not tilted followed photographs with tilted heads. Interestingly, in this final experiment, identification times were slower when direction of tilted head and target location corresponded. Implications are discussed.

Rejecting regularity: Giving up pattern search in number sequences—individual differences and tentative processes

Nico Gradwohl[1] & Hansjörg Neth[2]
[1]University of Konstanz, Graduate School of Decision Sciences, Psychology; [2]University of Konstanz, Social Psychology and Decision Sciences
nico.gradwohl@uni-konstanz.de

People are motivated and proficient concerning the detection of patterns in their environment. However, giving up searching for patterns is equally important for saving limited resources and avoiding false predictions. We investigate influences on giving up searching for regularity within a framework of ecological rationality, which considers characteristics of the individual and the environment to evaluate a strategy. We assume that both types of characteristics jointly influence the choice of strategies and subsequent classifications of number sequences. In an online experiment, participants classified different types of number sequences as either regular or irregular. Their classifications were analyzed in a signal detection framework. Judgments did not systematically differ between environments that selectively rewarded the detection of regular versus irregular sequences. Concerning individual differences, higher levels of objective numeracy were related to fewer false alarms. Moreover, higher levels of paranormal beliefs and conspiracy mentality corresponded to more false alarms. Finally, rejecting regularity took longer for difficult sequences that appeared to be regular at first sight, suggesting that the perceived probability of detecting regularity plays a role. Implications for the dynamics of the decision of giving up the search for regularity are discussed.

Design Factors (II): How Details of the Mouse Tracking Procedure Influence Action Dynamics in Cognitive and Value-Based Decision Paradigms

Tobias Grage[1], Martin Schoemann[1], Pascal J. Kieslich[2] & Stefan Scherbaum[1]
[1]Technische Universität Dresden, Department of Psychology; [2]University of Mannheim, Department of Psychology
tobias.grage@tu-dresden.de

The continuity of mind leaks into the continuity of movements. This is the core assumption underlying mouse-tracking as a method to trace cognitive processes. Given this assumption it is an important question whether the assumed interaction between mind and movement might be influenced by the measurement itself, that is, the methodological setup of mouse-tracking. Hence, we conducted two mouse-tracking studies (N = 40 each) in which we systematically investigated the influence of design factors on the quality of mouse-tracking measures. In a Simon task, we varied the mouse cursor speed and the response box location. In a classical intertemporal choice task, we varied the information complexity and the stimuli location. Additionally, in both studies we varied the starting procedure and the response procedure. Our results suggest that design factors influence the interaction between mind and movement and therefore have impact on mouse-tracking measures and the validity of the method itself.

Mobile Brain/Body Imaging in Neuroergonomics

Klaus Gramann
Biological Psychology and Neuroergonomics, TU Berlin
klaus.gramann@tu-berlin.de

Over the last two decades, technologies for investigating brain and behavior at work have advanced significantly providing mobile EEG and NIRS hardware to be synchronized with motion capture and other data streams to record human brain activity and behavior in applied work settings. New analyses methods are now available that allow for joint analyses of multi-modal data including behavior and brain dynamics of actively behaving humans. This kind of approach is relevant for neuroergonomics as it allows for a better understanding of the behavioral and neural requirements of working environments that require active physical interaction with often dynamically changing technical systems. The impact of motor planning and motor execution on cognition and brain dynamics, however is only purely understood. Mobile Brain/Body Imaging (MoBI) provides the methodological basis to overcome the restrictions of traditional neuroimaging modalities and to gain new insights into the complex interplay of cognition, active behavior and brain activity in mobile humans. It thus allows new insights not only into the brain at work but also allows improvement of working environments by providing user information that otherwise is only difficult to assess.

Persistence of perception-action interaction over time and proprioceptive interference

Maryvonne Granowski, Oliver Simon Sack & Christine Sutter
German Police University, Institute of Traffic Science & Traffic Psychology
m.granowski@web.de

In line with the theory of event coding (Hommel et al., 2001), Ladwig, Sutter and Müsseler (2012, 2013) showed in a n motor replication task that perceived visual and proprioceptive information interacts with action execution (cross talk). We further analyzed the persistence of cross talk within and between event files in a n-1 motor replication task with and without visual feedback. In the present experiment, we introduce a n motor replication task with a temporally delay between phase 1 and phase 2 to investigate the temporal persistence and the persistence to intermediate proprioceptive noise. Summing up, both results showed an assimilation (contrast) effect when analyzing cross talk within (between) event files and we ascertained that the pattern resulted only from characteristics of the motor system. Furthermore, we extend the view of resistant assimilation from visual information in motor replications irrespective of intermediate proprioceptive noise.

Pupil Dilation as an Indicator of Selection-Decision

Lukas Greiter, Christoph Strauch & Anke Huckauf
Ulm University, Department of General Psychology
lukas.greiter@uni-ulm.de

Pupil diameter is a popular peripheral indicator of psychological activation in a broad variety of contexts. More specifically, recent studies have shown that decisions and their outcomes are reflected in and can be predicted by means of pupil size. However, studies either involved visual target detection tasks, in which no corresponding distractor stimuli were provided, or decisions were always confounded with a motor response (button press). Using a selection task, we compared pupil responses to target and distractor stimuli employing a Go/NoGo-instruction. A total of 30 subjects performed the letter selection task. By applying a gaze-based spelling paradigm, subjects had to either select or reject letters that, correspondingly, either matched (targets) or mismatched (distractors) a word displayed on the screen. A Go/NoGo procedure was used to signal whether to respond manually via button press or not. Significant larger pupil dilations were obtained for targets compared to distractors, for both, the Go- and the NoGo-condition. We conclude that a decision in favor of selecting a target can be distinguished from a decision against selection, and this distinction is not dependent on a motor response.

The motor system's role in understanding and prediction

Luigi Grisoni & Friedemann Pulvermüller
Freie Universität Berlin, Department of Philosophy and Humanities, Brain Language Laboratory
grisoniluigi@zedat.fu-berlin.de

A classic framework views perceptual systems as filters channeling input information to higher centers, which fabricate cognition; the cognitive modules, in turn, use motor systems as slaves to move the body. However, more recent evidence suggests that motor mechanisms take a role in cognition. In this talk, we present evidence supporting a shared contribution of motor, sensory and multimodal areas of cortex to different cognitive processes. Current neuroscience data support a functional role of motor areas in language understanding and verbal working memory. When understanding concrete action-related words such as "grasp" or abstract symbols related to inner states, such as "love", human subjects activate their motor system. These activations involve specific subsections of the motor system, depending on the words' meanings. Crucially, sensorimotor system activity may even emerge before meaningful stimuli are perceived, thus reflecting semantic predictions the subject generates based on information from the context. These findings – that motor systems reflect specific content in semantic understanding and prediction – argue against classic modular models. More likely, distributed neuronal circuits in which motor neurons play a key part are the carriers of these higher cognitive functions.

Singleton search is a top-down strategy

Markus Grüner, Florian Goller & Ulrich Ansorge
University of Vienna, Department of Basic Psychological Research and Research Methods
markus.gruener@univie.ac.at

During singleton search, in each trial, participants are presented with a single target that stands out by one feature among more feature-homogeneous non-singleton distractors. Researchers have argued that singleton search is a top-down strategy. Accordingly, only cues matching the top-down search template should capture attention. Here, we tested the top-down theory. We investigated if, during the search for a color-singleton target of a known color, only color-singleton cues captured attention. All our cues had the same color as the target and were presented at target location or away from the target. All cues were on average uninformative of the target location. In line with the top-down theory, only singleton cues captured attention, with faster search times in valid than invalid conditions (validity effect). In contrast, double cues consisting of one cue at the target position and one cue away from the target (valid condition) or of two cues presented away from the target (invalid condition) created no validity effect.

Can we identify faking strategies in lie detection? A Diffusion Model Analysis of the Concealed Information Test

Bartosz Gula, Lars Reich, Gáspár Lukács & Rainer Alexandrowicz
University of Klagenfurt, Department of Psychology
bartosz.gula@aau.at

Lie detection paradigms, such as the reaction time-based Concealed Information Test (RT-CIT) are prone to faking (e.g. Suchotzky et al., 2017). Trained and informed fakers can efficiently reduce the difference in mean response times between irrelevant and probe items, leading to a classification accuracy of the guilt status at chance level. In the present studies, we addressed two main questions: (1) how well can the Drift Diffusion Model (DDM) explain the performance of guilty and innocent participants, and (2), can we use the DDM to describe and identify faking strategies. We expected that even in the case of equal mean RTs for irrelevant and probe items, faking strategies may be manifest in higher moments of the RT distributions. Based on published RT-CIT data (Verschuere & Kleinberg, 2015), we first show that for guilty participants drift rates differ between the two item types, and, their starting point z is more biased than that of innocent participants. Second, we report a mock crime study (N = 60) with three groups: innocent, guilty and guilty participants trained to speed up on probe items. The results will be discussed in terms of the DDM's propensity to identify faking strategies.

Is the head-fake effect in basketball robust against practice?

Iris Güldenpenning[1], Christoph Schütz[2], Matthias Weigelt[1] & Wilfried Kunde[3]
[1]University of Paderborn, Psychology and Movement Science; [2]Bielefeld University, Department of Sport Science; [3]Würzburg University, Department of Psychology
iris.gueldenpenning@uni-paderborn.de

We investigate whether extensive practice reduces the head-fake effect in basketball. Twenty participants performed 2080 trials within five successive days and were asked to classify video scenes of a basketball player either directly passing to the left/ride side or passing while gazing to the opposite direction. The analysis of the mean reaction times showed that the head-fake effect was significantly reduced from 44 ms at Day 1 to 36 ms at Day 5. Also, the reaction time frequency distribution of each participant was fitted to an ex-Gaussian distribution using a MATLAB routine. The analysis of the paramteres mu, sigma, and tau revealed that the head-fake effect was only present in the Gaussian part of the distribution (mu and sigma). An additional examinination of the ex-Gaussian distribution indicated that the head-fake effect results from a mixture of some slowed trials with some unslowed ones (mixture effect) in 25% of the participants, whereas the other participants showed a uniform slowing of all responses (uniform effect). Together, extensive practice with the task is sufficient to reduce the head-fake effect in basketball. This effect of practice might be reached with individually different processing strategies.

Speaking the part: Psychological correlates and efficacy of voluntary socio-emotional trait expression in voices

Stella Guldner[1], Carolyn McGettigan[2], Frauke Nees[3] & Herta Flor[3]
[1]University of Heidelberg, Central Institute of Mental Health, Institute of Cognitive and Clinical Neuroscience; Royal Holloway University of London, Vocal Communication Lab; University of Mannheim, Graduate School of Economic and Social Sciences; [2]Royal Holloway University of London, Vocal Communication Lab; [3]University of Heidelberg, Central Institute of Mental Health, Institute of Cognitive and Clinical Neuroscience
stella.guldner@zi-mannheim.de

The voice is a central social behaviour, but little is known of how it is used to navigate social interactions and achieve beneficial outcomes for the speaker. It has previously been shown that the voice can be voluntarily modulated to convey personality traits. A lack of adequate vocal modulation has been shown in people with deficits in social reactivity. In this study, we specifically investigated the relationship between social reactivity and successful conveyance of social information in the voice. 40 healthy adult participants took part in a vocal modulation task, in which they expressed socio-emotional traits (e.g. hostility, likeability) in their voice. To obtain efficacy estimates, the recordings were presented to naïve listeners for rating. Speakers' social reactivity was measured using self-report questionnaires. Voluntary expression of social traits in the voice is possible and effective, reflected in significantly higher perceptual ratings of the expressed trait compared to all other scales. Principal component analysis showed that socio-emotional traits are clustered on an affiliation dimension spanning from approach (likability) to avoidance (hostility). Moreover, individual voice modulation performance indices are significantly associated with speaker's levels of perspective taking. These findings advance our understanding of the significance of vocal behaviour for socio-emotional communication.

Movement (Re-)planning Interferes with Working Memory during the Maintenance Process: An ERP Study

Rumeysa Gunduz Can, Dirk Koester & Thomas Schack
Bielefeld University, CITEC
ruemeysa.guenduez@uni-bielefeld.de

The present study focuses on the neurophysiological interactions of manual actions with cognition. Particularly, we investigated neuro-cognitive costs of implementing a new movement plan for separate working memory (WM) domains (verbal, visuospatial) and processes (encoding, maintenance, retrieval). In a dual-task paradigm, 36 participants concurrently performed a WM task and grasp-to-place task (grasping a sphere to subsequently place it onto a target). For 30% of trials, ongoing movement was re-planned. This study employed a 2 (WM Task: Verbal, visuospatial) x 2 (Planning: Prepared, re-planned) within-subject design. Event-related potentials (ERPs) were analyzed separately for encoding, maintenance, retrieval processes. Behavioral analyses showed that memory performance decreased for both WM tasks when movement re-planning was required, i.e., domain-general re-planning interference in WM. ERP analyses showed only for the maintenance process that prepared trials elicited larger negative slow waves compared to re-planned trials regardless of WM task. That is, maintenance-related ERPs of verbal and visuospatial tasks were equally affected. Therefore, ERP findings support the domain-general re-planning interference. More importantly, for the first time, ERP findings show the process-specific (maintenance) re-planning interference at the neurophysiological level. In conclusion, the present study contributes to a better understanding of neuro-cognitive mechanisms of manual action flexibility.

The influence of competence expectations on nonverbal behavior of learners

Marcel Hackbart & Barbara Thies
Technische Universität Braunschweig, Institute of Educational Psychology
m.hackbart@tu-braunschweig.de

Competence expectations influence the teacher-student-interaction and can be self-fulfilling. Main focus of research in this area are the expectations held by teachers. However, students' expectations are also crucial regarding teacher-student-interaction (Nickel, 1985). To identify how student expectations influence teachers, the influence of expectations on students' behavior needs to be explored. Therefore, the aim of the presented study is to investigate, whether competence expectations of learners affect their behavior. Participants (N=62) were invited under a cover story to a laboratory investigation. They believed the study was about teacher supervision. At the beginning, the participants read a certificate about the teacher (either a good or a bad one), then they saw a lecture by the supposed male or female teacher (video recording that was claimed to be a live broadcast). During the lecture, the participants were filmed. Nonverbal behavior of the participants was analyzed (e.g. forward lean, eye contact). Results revealed that participants who expected a competent teacher had less eye contact and supported their heads for a shorter period of time than participants who expected an incompetent teacher. There was no effect for sex of the teacher on the nonverbal behavior.

Attention blinks irrespective of (lavender or peppermint) odor

Ryan Hackländer, Pamela Baess, Clara Hellweg & Christina Bermeitinger
University of Hildesheim, Cognitive Psychology
hacklaen@uni-hildesheim.de

A recent study (Colzato et al., 2014) provided evidence that ambient odors influence temporal allocation of attention in an attentional blink paradigm. In two experiments, the authors reported larger AB effects when subjects performed the AB task in the presence of peppermint than lavender odor. This pattern was explained by an odorant-related change in the focus of attention due to the presence of an apparently stimulating vs. relaxing scent. As the odors in their study were presented ambiently, the method of odor presentation, rather than a specified cognitive mechanism, could influence the observed result pattern. The presence of a single odorant over a longer time period might be functionally different than varying odorants on a trial-by-trial basis. Using an olfactometer enabling a trial-wise modulation of the odor presentation, we conducted three experiments aimed at further investigating the effects of the two odorants, as well as presentation method and exposure duration. Across all three experiments, we failed to find evidence in support of the notion that the attentional blink is increased or attenuated by the presence of specific odors. Our results will be discussed in relation to previous research and in light of general research principles of aromacology.

The effect of walking on human visual perception

Barbara Händel & Liyu Cao
University of Würzburg, Department of Psychology
liyu.cao@uni-wuerzburg.de

Our knowledge about human perception largely derives from laboratory research where participants are required to sit still, keep fixation, avoid blinks etc. During natural behaviour (e.g. walking), we know little about human perceptual performance and the underlying brain activity. We investigated the effect of free walking on visual perception using EEG and behavioural responses. Data were collected from 30 participants while standing still, walking slowly or with normal speed. Participants performed a contrast detection task in a centrally presented flickering grating under 4 different levels of surround contrast using video goggles. We show that the steady state visual evoked potentials (SSVEP) from the central grating were modulated by level of surround contrast (surround suppression) and walking speed, with decreasing SSVEP amplitudes for increasing walking speeds. Interestingly, an interaction effect between walking speed and level of surround contrast on the SSVEP amplitude indicates that the surround exerted more influence on the central flicking grating when participants were walking compared to standing still. Behavioural data (detection rate/response time) showed similar effects. Corroborating findings in the mouse model, our data suggest that surround suppression is influenced by walking but might be different for peripheral compared to central visual input.

Independent effects of eye and hand movements on visual working memory

Nina Maria Hanning & Heiner Deubel
Ludwig-Maximilians-Universität München, Allgemeine und Experimentelle Psychologie
hanning.nina@gmail.com

Saccades and reaches have been shown to selectively interfere with visual working memory, presumably due to the deployment of spatial attention to their action goals. Given the assumption of independent attentional mechanisms for the selection of eye and hand targets, the question arises whether the two effector systems also separately interact with visual working memory. To approach this issue, we investigated memory performance in combined eye-hand movements. Participants memorized several items and performed eye, hand, or combined eye-hand movements during the maintenance interval. Subsequently, we tested working memory performance at motor goals and action-irrelevant locations. We found that for single eye and single hand movements, working memory performance was increased at the motor target compared to the action-irrelevant locations. Remarkably, the same amount of benefit was found at both the eye and the hand target for combined eye-hand movements – with no memory tradeoff between the two targets. We conclude that both effector systems independently enhance visual working memory at their goal location. This is in line with the assumption that eye and hand targets are selected by separate attentional mechanisms.

Collaborative Spatial Search within Walkable Virtual Environments – the Influence of Global Reference Information

Maxine Hanrieder, Katja Kaiser, Adamantini Hatzipanayioti, Betty Mohler & Tobias Meilinger
Max Planck Institute for Biological Cybernetics, Department of Human Cognition, Perception and Action
adamantini.chatzipanagioti@tuebingen.mpg.de

Collaborative spatial search is an important task, for example, when firefighters or rescue teams search for victims within a building. In two experiments we examined the distinction between individual and collaborative search and the influence of common reference information on these two types of search. In Experiment 1, individuals and dyads were asked to walk through and fully cover virtual city environments of varied complexity displayed on head mounted displays. We recorded search time and missed locations. With increasing environmental size and resultant increasing memory load participants missed more target locations. Dyads showed longer added trajectories than individuals, but less self-overlap with their own trajectory (i.e., walking the same section multiple times). This suggests that the between-trajectories-overlap between searchers was responsible for the inefficient trajectories in collaborative search. In Experiment 2, we provided participants with a compass to facilitate organization of their searches. However, results were similar to those of Experiment 1. Mere orientation cues without a-priori environmental information seem insufficient to divide the search task and improve search performance.

The semantic content of abstract concepts: A property listing study of 296 abstract words

Marcel Harpaintner
Ulm University, Department of Psychiatry
marcel.harpaintner@uni-ulm.de

The grounding of concepts in modality-specific systems is discussed controversially. Grounded cognition theories propose that concepts are embodied in the sense that they are represented in distinct modal brain areas depending on specific sensory and motor experiences during concept acquisition. Accumulating evidence suggests that concrete concepts are indeed linked closely to modality-specific systems, whereas the conceptual representation of abstract words is often seen as a major counter-argument against embodied approaches. Here, we investigated the semantic content of abstract concepts by using a property generation task. Participants were asked to write down properties such as features, situations and associations coming into mind for 296 abstract concepts. These properties were categorized by a coding-scheme making a classification into modality-specific and verbal contents possible. As hypothesized, we found considerable percentages of generated introspective, affective, social, sensory and motor-related properties, in addition to verbal associations, revealing the heterogeneity of the abstract concept class. Although the present property listing study does not formally allow to test competing theories of the representation of abstract concepts, we argue that the presence of modal properties in participants' listings constitutes an important prerequisite for the validity of grounded cognition theories.

Adaptive Control of Working Memory

Eva-Maria Hartmann, Stefanie Ochsenkühn, Marco Steinhauser & Miriam Gade
Katholische Universität Eichstätt Ingolstadt, General Psychology
eva-maria.hartmann@ku.de

The present study aimed at investigating the mechanisms of adaptive cognitive control in declarative working memory (WM). According to the WM model by Oberauer (2009), declarative WM holds available objects for current processing whereas procedural WM provides operations to be performed on selected objects. The two systems have been shown to operate analogously in selection processes. Adaptive control refers to the finding of flexible adjustments of current processes in face of cognitive conflict. For instance, a higher frequency of incongruent stimuli, that is stimuli evoking conflicting response tendencies leads to a higher level of cognitive control as reflected by smaller congruency effects (i.e., the difference between congruent and incongruent items). To test for the analogy of conflict adaptation in declarative WM, we used three different paradigms and manipulated the frequency of congruent items probed across blocks. Participants memorized two lists of four items (e.g., 2-5-7-1) and we constructed congruent items by linking the same position across both lists to the same digits (e.g., second and fourth item in lists 2-5-7-1 and 3-5-8-1). In all three experiments, the results replicated the classical frequency congruency effect, providing further evidence for the assumed analogy of procedural and declarative WM.

Recovering Rasch Model Parameters when the True Latent Traits are not Normally Distributed: Comparison of Bayesian and Likelihood-Based Approaches

Raphael Hartmann
Albert-Ludwigs-Universität Freiburg, Department of Psychology
raphael.hartmann@psychologie.uni-freiburg.de

This simulation study compares the Rasch model parameter estimates of five different estimators when the latent trait distribution is skewed; hierarchical Bayesian models with normal, skew normal, and mixture normal ability priors, the conditional maximum likelihood, and the marginal maximum likelihood estimator. We generate true latent traits from four skewed and one standard normal distribution, and difficulty parameters from a standard normal distribution. The comparison of the estimates is based on the mean squared error (MSE) and the bias for all latent trait conditions. We also check whether sum score skewness values have an influence on the estimates. The Bayesian model with the skew normal ability prior shows overall the best performance; its average MSE is almost always among the two lowest as well within the latent trait conditions as within the sum score skewness conditions. Its mean bias is not as consistently good, but still among the best in most conditions. We strongly recommend to use it, but we also recommend to compare the ability parameter estimates with the extremely high (> 2) and low (< -2) estimates of the MML since it performs worse than the MML there, especially for low test lengths.

Emotion-Induced Memory Modulation: Bimodal Integration and the Effects of Inhibitory Control

Lisa Christina Hasenbein & Arianne Herrera-Bennett
Ludwig-Maximilians-Universität, Psychology
lisa.hasenbein@campus.lmu.de

The functionalist framework (Farb et al., 2013) views emotion as a tool to shape attention and perception, rather than limiting it to the affective component of experience. Accordingly, the present study examines the interplay between emotion and cognition at the level of bottom-up processes, namely when information is presented from two concurrent sources. While past research indicates that individuals automatically combine audiovisual stimuli (i.e. facial and vocal expressivity) when judging emotion, even when tasked to ignore audio stimuli (de Gelder & Vroomen, 2000; Dolan et al., 2001), such studies do not account for the role of executive functions when evaluating effects on accuracy and speed of emotion identification. Our study replicates the aforementioned bimodal integration paradigm, taking inhibition-related functions (Friedman & Miyake, 2004) as potential moderators, as well as measures of subsequent recall (faces and sentence content). Repeated-measures ANOVA results support past findings: congruency of emotion between modalities led to quicker and more accurate identification, compared to incongruent/neutral trials. Effects of prosody on perception are expected to be more pronounced in subjects with low inhibitory control. Moreover, results speak to effects of integration on information retention, whereby greater inhibition of peripheral content should be reflected in greater memory trade-offs.

Mousetrap: An R package to process, analyse, cluster, and visualize hand- and mouse-trajectories

Jonas MB Haslbeck[1], Dirk U Wulff[2], Pascal J Kieslich[3], Felix Henninger[4] & Michael Schulte-Mecklenbeck[5]
[1]University of Amsterdam; [2]University of Basel; [3]University of Mannheim; [4]University of Koblenz-Landau; [5]University of Bern
dirk.wulff@gmail.com

Mouse- and hand-tracking tracking technologies are increasingly employed to shed light on the cognitive processes underlying a diverse range of behaviour ranging from recognition memory to social games. In this talk, I present the mousetrap package for the statistical programming language R. This package can import mouse- and hand-tracking data from a variety of sources. It offers functions for preprocessing, analysing, and visualizing mouse and hand movements, and calculates a variety of established measures for curvature, complexity, velocity, and acceleration. In addition, the package offers a number of options for advanced analyses, such as spatial clustering of trajectories, the identification of different trajectory types, and the animation of trajectories. Using this package, I will showcase what mouse- and hand-tracking can and cannot reveal about the underlying cognitive process and discuss best practices. The mousetrap package is open-source and freely available from http://pascalkieslich.github.io/mousetrap/.

Alignment effects in spatial perspective taking from an external vantage point

Adamantini Hatzipanayioti[1] & Marios Avraamides[2]
[1]Max Planck Institute for Biological Cybernetics, Department of Human Cognition, Perception and Action; [2]University of Cyprus, Department of Psychology
adamantini.chatzipanagioti@tuebingen.mpg.de

Previous research suggests that reasoning about imagined perspectives within immersive environments is difficult. In two experiments we examined the alignment effects (i.e., poor performance as the difference between one's actual and imagined perspective increases) when the observer is external to the scene. Participants adopted imagined perspectives around a table and pointed to the position of a target. In Experiment 1 the spatial scene was experienced either as immediate in immersive virtual reality (VR) with participants located within the scene or as remote presented on a virtual screen within VR. In Experiment 2 participants viewed the scene on a screen in real world. Results showed that the size of the alignment effect was similar across environments in Experiment 1, suggesting that viewing the scene as immediate or remote does not create additional conflicts in perspective taking. However, when the scene was presented in the real world (Experiment 2) the alignment effect was smaller compared to viewing the scene remotely in VR (Experiment 1). Although one would expect that immersive scenes would yield a strong alignment effect, in fact having visual access to body information which by default is lacking in VR, might be an important factor for perspective taking.

Gamma band oscillations mediate comprehension of metaphoric co-speech gestures

Yifei He & Benjamin Straube
Philipps-University Marburg, Department of Psychiatry and Psychotherapy
heyifei1984@gmail.com

Metaphoric gestures are used to communicate abstract information by referring to gestures that are clearly concrete (e.g. raising a hand for 'the presentation is on a high level'). Compared to linguistic metaphor, the comprehension of metaphoric gesture has not been studied. In the current experiment, we set out an EEG experiment investigating the comprehension of metaphoric (MP) vs. iconic (IC) co-speech gestures in different language contexts. German participants (n=20) viewed video clips with an actor performing both types of gestures accompanied by either comprehensible German (G) or incomprehensible Russian (R) speech, or speaking German sentences without any gestures (N). Time-frequency analysis of the EEG data showed that, MPG vs. ICG elicited parietally-distributed power decrease in the gamma band (50-70Hz) between 500-700ms, and this effect was source-localized to the right middle temporal gyrus. However, this MP-IC effect was reduced in the Russian language (R) and no-gesture conditions (N). Additionally, item-based correlation analysis suggested that gamma power correlates positively with concreteness ratings of the co-speech gestures. Our findings showed the relevance of gamma-band oscillations to higher-order semantic processes during comprehending metaphoric co-speech gestures (Lewis & Bastiaansen, 2015), especially with regard to integrating concrete gestures to abstract speech.

Extra-retinal and intersensory aspects of cybersickness

Heiko Hecht[1], Behrang Keshavarz[2] & Suzanne Nooij[3]
[1]Johannes Gutenberg-Universität Mainz; [2]Toronto Rehabilitation Institute; [3]Max-Planck Institut für Kybernetische Biologie Tübingen
hecht@uni-mainz.de

Visually induced motion sickness (VIMS) is a common side-effect in virtual environments and simulators. We hold that sea sickness and cyber sickness are of the same origin. In both cases, the vestibular afferents and proprioceptive information disagree with the visual information about body posture and movement. If one modality (or more) is in conflict with the physical movement of our body, motion sickness ensues. We report a number of studies that we have conducted to investigate how repeated exposure, complexity of the visual stimulus, odors, and music influence the genesis of VIMS. Since the standard method to measure VIMS, via the Simulator Sickness Questionnaire, is rather time-consuming, it does not lend itself to taking the repeated measures necessary to portray the time-course of VIMS. We have validated a fast motion sickness scale (FMS) that is up to the job. Our results qualify and refine the conflict theory of motion sickness – and may even challenge it. On the one hand, basic visual parameters, such as brightness and contrast, were rather inconsequential for the degree of VIMS. On the other hand, vection, stereopsis, and other extra-retinal factors, such as music and odors, had substantial influence on the genesis of VIMS.

Jointly Modeling Mouse-Trajectories and Accuracies with Generalized Processing Trees

Daniel W. Heck, Edgar Erdfelder & Pascal J. Kieslich
University of Mannheim
heck@uni-mannheim.de

To test psychological theories, the mouse-tracking methodology often focuses on the effect of experimental manipulations on trajectory curvature. Many mouse-tracking studies involve tasks with an objectively correct answer and exclude trials with incorrect answers from analysis. Moreover, studies are typically limited to mean-level analyses of simple indicators of trajectory curvature (e.g., maximum deviation) and comparisons of these means between conditions. However, such analyses ignore the accuracy of responses and cannot account for the bimodality often observed in mouse-tracking data on the trial level. As a remedy, we propose Generalized Processing Tree (GPT) models as a flexible approach for the analysis of mouse-tracking data. Psychologically, GPT models assume a finite number of latent cognitive processes to jointly account for both the response frequencies and the curvature of the mouse trajectories. Statistically, GPT models assume finite mixture distributions with weights determined by a processing-tree structure of conditional probability parameters, and continuous component distributions such as Gaussians with separate or shared means across states. We highlight theoretical and statistical benefits of GPT models for mouse-tracking data using semantic categorization and related tasks as an example.

How performance-contingent reward prospect modulates cognitive control: Rigid usage and maintenance of predictive and non-predictive contextual information

Carmen Hefer & Gesine Dreisbach
University of Regensburg
carmen.hefer@psychologie.uni-regensburg.de

Hefer and Dreisbach (2017) showed that the reward effect in terms of increased cognitive stability comes at the cost of decreased flexibility: A reward group showed persistent cue-usage even when cue-information changed from highly predictive to non-predictive. Aim of the present study was to investigate whether reward-prospect (compared to no reward) also impairs the adaptation process when the cue-information changes from non-predictive to highly predictive. To this end a modified version of the AX-continuous performance task was used. In the first two experiments no answer to this question could be found because the rewarded group showed signs of enhanced cue-usage already for the non-predictive cues. In Experiment 3, where any misleading information was removed, we found evidence that a change from non-predictive to predictive cues lead to increased cue-usage in both, reward and neutral group. Results of the first two experiments thus demonstrate that reward prospect leads participants to use any potentially relevant information, even at the expense of higher errors. Results of Experiment 3 allow to answer the original question: Reward does not prevent the adaptation from non-predictive to highly predictive cues.

Characterizing explicit and implicit contributions to visuomotor adaptation

Mathias Hegele
Justus-Liebig University, Department of Psychology and Sport Science
mathias.hegele@sport.uni-giessen.de

Adaptation to novel visuomotor transformations is not a unitary process, but comprises explicit as well as implicit knowledge that together contribute to overall adaptation. By implicit knowledge, I refer to the development of an internal models that approximates the transformation and gives rise to aftereffects. By explicit knowledge, I refer to conscious awareness of characteristics of the transformation, which can serve as a basis for conscious and intentional strategic corrections of otherwise spontaneously executed movements. An experimental paradigm is introduced with which explicit and implicit components of adaptation can be dissociated by using a comprehensive set of visual open-loop tests. In those tests, participants are explicitly informed about the presence/absence of the transformation in order to obtain measures of aftereffects that is unconfounded by conscious strategic corrections. In addition, a test of explicit knowledge is included in which explicit judgments of the movement orientation believed to be appropriate to reach the visual targets in the presence of the visuomotor transformations are collected. Empirical findings will be presented characterizing explicit and implicit adaptive processes with respect to their sensitivity to aging, their potential for generalization, and their susceptibility to delays in outcome feedback.

Inability to decode predictable semantic categories from EEG during silent pauses in spoken language

Edvard Aslak Heikel, Jona Sassenhagen & Christian J. Fiebach
Goethe University of Frankfurt
edvardheikel@gmail.com

Predictive coding proposes that the brain continuously predicts incoming sensory information in a probabilistic, Bayesian-like manner, based on mental models of the external sources of sensory information. Many neural correlates of language processing seem to be plausibly associated with the prediction error (e.g. violation-related ERPs like the N400). However, the neural signatures of linguistic predictions themselves have so far remained elusive. One plausible approach to identifying neural correlates of top-down predictions during perception is to abolish bottom-up sensory information. We aimed to investigate the neurophysiological realization of linguistic predictions during the perception of spoken sentences, by using EEG and two separate multivariate pattern analysis (MVPA) approaches (Generalization Across Time, XDawn) to decode the semantic category of a predictable word from brain activity during a 1 second pause preceding the word itself. In two separate studies, pauses were inserted prior to target words occurring in sentence contexts that were constraining towards either an animate or an inanimate noun (Experiment 1, N=41), or an abstract or concrete noun (Experiment 2, N=36). Analyzing EEG activity during the pre-target word pause with MVPA, we found no evidence for above chance decoding, neither for animacy nor for concreteness ($p > .05$; accuracies ~50%).

Of revolutionaries and sycophants: Insight into the effects of group status and permeability of group boundaries on multiple aspects of in-group identification

Paul Michael Heineck, Jenny Roth & Roland Deutsch
University of Würzburg, Department of Psychology II
paul-michael.heineck@stud-mail.uni-wuerzburg.de

Research shows that low group status reduces in-group identification compared to high status, especially when group boundaries are permeable. However, previous research did not differentiate among distinct aspects of in-group identification (e.g., satisfaction, solidarity, centrality, in-group homogeneity, and individual self-stereotyping). Considering the various aspects will shed light on how people deal with the threat of low status. In two experiments, we test the influence of group status and permeability on in-group identification aspects. Assuming that solidarity serves as a functional coping strategy (collective action), we hypothesize that impermeability increases solidarity in low status groups compared to when group boundaries are permeable, without influencing another aspect of in-group identification. In Experiment 1, we assigned participants to novel social groups and manipulated group status and permeability and assessed in-group identification aspects. The results showed no evidence for the hypothesized alteration of solidarity in response to the (im)permeability. The effect of status was marginally significant, mainly driven by satisfaction (consistent to our previous findings). For method improvements, in Experiment 2, we will instruct participants to indicate a group that they belong to which is of low/high status and low/high permeability. Results are still pending but will be presented on the poster.

Post-Conflict Speeding in Motivational Conflicts

Christina Heitmann & Roland Deutsch
University Würzburg, Psychology
christina.heitmann@uni-wuerzburg.de

Sequential effects in conflict processing, such as post-conflict slowing, have primarily been studied in stimulus-response compatibility (SRC) tasks, such as the Simon or Stroop task. Although some researchers suggest that similar processes play a role in higher-level motivational conflicts, we propose that SRC-based theories on conflict processing cannot be applied to approach-approach (AA) and avoidance-avoidance (VV) conflicts without modification. We expected the intrinsic valence and motivational orientation of motivational conflicts to modulate sequential effects. Specifically, instead of post-conflict slowing, we predicted speeding after AA conflicts, because we expected the approach motivation component of AA conflicts to induce a short-lived increase in action-readiness. To test this prediction, participants repeatedly solved AA, VV, or no conflicts (NC) by choosing one of two valent vignettes in three experiments. In Experiments 2 and 3, we manipulated the intertrial interval (ITI) to examine the time course of sequential effects in motivational conflicts. We observed the expected speeding after AA conflicts in Experiment 1 and the short ITI condition of Experiment 2 and 3. As sequential effects emerge in higher-level motivational conflicts and are modulated by the type of conflict, these results extend previous research and theory on sequential effects in conflict processing.

The influence of task relevance in a dual task situation

Clara Hellweg & Christina Bermeitinger
Universität Hildesheim, Institut für Psychologie
hellweg@uni-hildesheim.de

Everyday life often requires us to perform more than one task at a time. In these situations task performance in one or both tasks is often impaired. Sometimes one task is more important than the other one. The present study examines how task relevance influences dual task performance. Participants worked through tasks from the German version of the Compound Remote Associate (CRA) Test while simultaneously performing a spatial cueing paradigm. We varied the importance of both tasks between subjects. The results suggest that performance in a dual task situation is influenced by the relative importance of each individual task.

To kill or not to kill – Scrutinizing the effects of personal involvement, death avoidability, and egoistic incentives on moral judgment in sacrificial dilemmas

Max Hennig & Mandy Hütter
Eberhard Karls Universität Tübingen
maximilian.hennig@uni-tuebingen.de

Moral judgment research has traditionally relied on sacrificial dilemmas, in which one has to decide whether to kill one person in order to save the lives of several others. In this traditional paradigm, not killing would be interpreted as an inclination to adhere to absolute norms, while killing was taken to indicate a sensitivity to consequences of an action. However, the traditional dilemma approach suffers from several methodological problems. First, it is not clear whether killing someone is motivated by a focus on consequences or the rejection of norms. Second, the decision to kill or not to kill may be heavily influenced by general (in)action tendencies. Due to these limitations, interpretation of previous results indicating that dilemma judgments depend on the avoidability of the death of the target person, the presence of egoistic incentives, and psychological distance during the act of killing remains ambiguous. Applying multinomial processing tree modelling to avoid these problems, we investigated the mechanisms underlying those effects. The results of a high-powered study (N = 692) suggest that egoistic incentives impact moral dilemma judgments by influencing consequence-focused processing, while death avoidability exerts an effect via norm-focused processing. These findings challenge recent theories of moral judgment.

lab.js: A free, open, online experiment builder

Felix Henninger[1], Ulf K. Mertens[2], Yury Shevchenko[3], Pascal J. Kieslich[3] & Benjamin E. Hilbig[1]
[1]University of Koblenz-Landau, Cognitive Psychology Lab; [2]University of Heidelberg, Psychological Methods; [3]University of Mannheim, Chair of Experimental Psychology
mailbox@felixhenninger.com

lab.js makes it easy to build experiments for both online and in-laboratory data collection. Through its visual interface, stimuli can be designed and combined without programming, though studies' appearance and behavior can be fully customized using code if required. The browser-based runtime enables fast-paced stimulus presentation, and provides accurate measurement of response times. Experiments constructed with lab.js can be exported to any web server for online data collection, and included in common survey tools. Studies can also be shared, archived, re-used and adapted, enabling effortless, transparent replications, and cumulative science; we provide a library of common paradigms and demonstrations as a starting point. The software is provided free of charge under an open-source license; further information, code and extensive documentation are available from https://felixhenninger.github.io/lab.js/

Habit outweighs Planning in Grasp Selection for Object Manipulation

Oliver Herbort
Julius-Maximilians-Universität Würzburg, Department of Psychology
oliver.herbort@psychologie.uni-wuerzburg.de

Actions are usually planned with the next step in mind. For example, participants who grasp and manipulate objects select grasps that reduce the arm excursion at the end of the object manipulation ("end-state comfort effect"). We addressed whether the adjustment of grasps to subsequent object manipulations is controlled habitually, based on experienced action outcomes, or by planning, based on an evaluation of expected action outcomes. In an experiment, we devaluated the adjustment of grasps to various dial rotations, which led to a reduction of the end-state comfort effect. Participants continued to use the grasps acquired during the devaluation phases in test trials, even though adjusting the grasp to different rotations would have been more efficient in these trials. This suggests that grasp selection for object manipulation is primarily under habitual control. Thus, grasp selection for object manipulation (i.e., the end-state comfort effect) is not primarily driven by the anticipation of upcoming object manipulation movements or their end-states.

P-distribution: Optimizing the inferential value of p-values via resampling techniques

Arianne Herrera-Bennett & Moritz Heene
Ludwig-Maximilians-Universitaet, Psychology in the Learning Sciences
arianne.herrera-bennett@psy.lmu.de

Psychologists are increasingly calling into question whether researchers should trust single studies and p-values interpreted in isolation. Demonstrated in Cumming's 'dance of the p-values', the unpredictable nature of p-values supports the statistical reform push toward use of replication and meta-analytic techniques, to create a fuller evidential context within which to evaluate phenomena. P-values, however, can be highly informative when expected variation in replication is accounted for: The theoretical distribution of p-values can be determined as a function of effect size (ES); null effects have uniform plots, whereas larger effects become right-skewed. The current research appeals to Monte Carlo simulation to investigate how resampling k subsamples (n) from the same initial sample (N), and plotting the p-distribution, might provide further informational value, within the context of drawing inferences from a single study. Design follows a 3 (N: 100, 500, 1000) x 3 (n: 10, 50, 100) x 4 (ES: 0.0, 0.2, 0.5, 0.8) x 2 (with vs. without replacement) model. Observed ES is calculated for each p-value. P-distribution shape and mean ES estimates are compared against population parameters, and serve as proxies for population representativeness. Results explore how 'contextualizing' single p-values within a p-distribution, via resampling techniques (e.g., bootstrapping), can optimize p-values' inferential value.

Visual feature prediction before saccadic eye movements

Arvid Herwig & Christian H. Poth
Bielefeld University, Department of Psychology & CITEC
arvid.herwig@uni-bielefeld.de

Saccadic eye movements change the retinal position and spatial resolution of objects. The visual system seems to accommodate these changes by predicting object features across the saccade, based on learned associations between presaccadic and postsaccadic input (Herwig & Schneider, 2014, JEPG). Accordingly, peripheral perception should be biased toward previously associated foveal input shortly before a saccade is executed. Such bias effects can be evoked by altering participants' visual stimulation, so that one object is systematically changed during saccades. Up to now, these bias effects were tested only indirectly by adjusting a postsaccadic foveal test stimulus to the memorized presaccadic peripheral stimulus. Therefore, it is unclear whether the biases really arise predictively, in presaccadic perception, or retrospectively, in postsaccadic memory. To clarify this issue, we replaced the postsaccadic adjustment task with a 2AFC-task: A central and peripheral stimulus were presented simultaneously before the saccade and participants had to select the stimulus that was more curved. Importantly, the results showed clear biases in the PSEs for objects whose curvature had changed in a preceding learning phase. This provides direct evidence that the feature biases arise in a predictive fashion in presaccadic perception.

Category-selective processing in the two visual pathways as a function of visibility

Guido Hesselmann, Natasha Darcy & Philipp Sterzer
Charité-Universitätsmedizin Berlin
g.hesselmann@gmail.com

Category-selective visual processing is a core characteristic of the ventral vision-for-perception pathway, but it is also found in cortical areas along the dorsal vision-for-action pathway. According to the two-visual-systems hypothesis (TVSH), ventral stream processing is closely linked to visual awareness, while dorsal stream processing is not. Category-selective processing of fully visible stimuli has been reported in both pathways, but so far the relationship between levels of visibility and functional activity has not been systematically examined for both streams. Recently, we used continuous flash suppression (CFS) in a functional magnetic resonance imaging (fMRI) study to modulate the visibility of face and tool stimuli (Ludwig, Sterzer, Kathmann, & Hesselmann; Cortex, 2016). Using multivariate pattern analysis (MVPA), we observed that decoding accuracies in ventral areas more closely reflected graded differences in awareness compared to dorsal areas. In our follow-up fMRI experiment (N=20), we modulated the recognisability of the same stimulus sets by linear combinations of the original images and phase noise images. The phase noise approach minimizes the low-level differences between images associated with different signal-to-noise ratios and levels of visibility. Our fMRI-MVPA analysis explores the visibility tuning curves of category-selective cortical areas in the human ventral and dorsal visual pathways.

Separate and combined effects of action relevance and motivational value on visual working memory

Anna Heuer & Anna Schubö
Philipps-Universität Marburg
anna.heuer@uni-marburg.de

The attentional modulation of visual working memory (VWM) according to differences in task-relevance, established with the retrocue paradigm, has attracted considerable interest in recent years. In the present study, we examined two more indirect selection biases established by concurrent tasks or learnt reward associations: action relevance and motivational value. In three experiments, memory performance was assessed with the same colour change detection task. Potential action relevance and motivational value were each determined by a specific feature of the memory items (location and shape) and manipulated in an orthogonal fashion. Investigated in isolation (Experiments 1A and 1B), both selection biases modulated VWM. In combination (Experiment 2), action relevance and motivational value still each exerted an influence on VWM, but not in a fully independent and additive manner. While action relevance impacted on performance irrespective of the reward associated with the items, an effect of motivational value was only observed for action-irrelevant items. These results support the notion that VWM is automatically biased as an inherent part of action planning. More generally, these findings highlight the versatile nature of VWM: Contents can be flexibly weighted to reflect differences in their importance, taking into account several sources of information.

Automatic Preference Acquisition: Subliminal stimulus presentation in Evaluative Conditioning

Tobias Heycke & Christoph Stahl
University of Cologne, Department of Psychology
t.heycke@uni-koeln.de

Evaluative Conditioning (EC) is defined as a change in liking of a target object (conditioned stimulus, CS) that is due to the pairing of the CS with a negative or positive stimulus (unconditioned stimulus, US; De Houwer, 2007). Evaluative Conditioning is proposed as a mechanism of automatic preferences acquisition in dual-process theories of attitudes (Gawronski & Bodenhausen, 2006). Support for the automaticity of EC comes from studies showing EC effects for subliminally presented stimuli (e.g., Rydell, McConnell, Mackie, & Strain, 2006; Dijksterhuis, 2004). However, the findings of previous studies showing subliminal EC, have recently been challenged on methodological grounds (Sweldens, Corneille, & Yzerbyt, 2014) and by empirical findings (Stahl, Haaf, & Corneille, 2016). In a series of Experiments we investigated possible boundary conditions for EC effects to occur with subliminally presented stimuli. Specifically, we tested whether the following settings would be beneficial for EC effects to occur: (I) goal-relevance during the learning procedure and a relation between CS and US (II) subliminal US presentation with additional counter attitudinal information and (III) a simultaneous presentation of CS and US. We found indications for the absence of EC effects in all paradigms and implications for theories explaining EC are discussed.

Gender differences in multitasking

Patricia Hirsch[1], Iring Koch[1] & Julia Karbach[2]
[1]RWTH Aachen University, Cognitive and Experimental Psychology; [2]University of Koblenz Landau, Developmental and Educational Psychology
patricia.hirsch@psych.rwth-aachen.de

To examine whether there are gender-related differences in multitasking performance, 48 female and 48 male subjects participated in a task-switching experiment and a dual-task experiment. In the task-switching experiment, we found mixing costs (i.e., repetition trials of mixed-task conditions vs. single-task conditions) and switch costs (i.e., repetition trials vs. switch trials of mixed-task conditions). In the dual-task experiment, we observed dual-task costs (i.e., Task 2 [T2] performance in dual-task conditions vs. performance in single-task conditions) and a psychological refractory period (PRP) effect (i.e., T2 performance with short vs. long stimulus onset asynchrony, SOA). Neither the switching-related performance costs nor the dual-task related performance costs differed across gender, suggesting a comparable multitasking performance for women and men.

Zum Einfluss sozialer Erwünschtheit auf Selbstberichte der Organspendebereitschaft – eine experimentelle Validierung zweier Non-Randomized-Response-Verfahren

Adrian Hoffmann & Jochen Musch
University of Duesseldorf, Department of Psychology
adrian.hoffmann@uni-duesseldorf.de

Die Ergebnisse aktueller Umfragen legen nahe, dass bis zu zwei Drittel der deutschen Bevölkerung grundsätzlich zu einer Organspende bereit sind (Uhlig et al., 2015); tatsächlich führen jedoch gerade einmal 15-25% der Bevölkerung einen Organspendeausweis mit sich (Krampen & Junk, 2006; Heuer et al., 2013). Die soziale Erwünschtheit der Bereitschaft zur Organspende könnte diese Diskrepanz erklären; die tatsächliche Spendebereitschaft würde demnach in Selbstberichten überschätzt werden. Mit zwei indirekten Non-Randomized-Response-Befragungsverfahren (Tian & Tang, 2014; Yu, Tian & Tang, 2008) wurde der Einfluss sozial erwünschten Antwortverhaltens kontrolliert. Erwartungsgemäß führten beide Verfahren zu niedrigeren Schätzungen des Anteils spendewilliger Umfrageteilnehmer als eine direkte Befragung. Die niedrigeren Schätzungen sind potentiell weniger durch sozial erwünschtes Antwortverhalten verzerrt und insofern valider. Vor- und Nachteile der verwendeten Modelle sowie die Implikationen der Ergebnisse für die Umfrageforschung werden diskutiert.

Integrating cue abstraction with retrieval from memory: A learning approach

Janina Hoffmann[1], Rebecca Albrecht[2] & Bettina von Helversen[3]
[1]University of Konstanz; [2]University of Basel; [3]University of Zurich
janina.hoffmann@uni-konstanz.de

When making a judgment, such as evaluating the food in the cafeteria, it has been argued that people select among two kinds of judgment strategies: a capacity-limited abstraction of knowledge and a similarity-based retrieval of past instances. To disentangle these strategies, past research has usually assumed that people consistently pursue the same strategy over time. The question of how strategies change over time as a function of learning has received less attention. The current work aims to fill this gap by formulating a learning model that develops a preference for one strategy over the other over time by adjusting the relative importance of different cues and past exemplars during learning. In simulations, the learning model replicates previous research findings, such as the finding that linear relationships are learned faster than nonlinear ones. Importantly, the learning model allows to disentangle trial-by-trial strategy shifts from a preference for integrating knowledge abstraction with exemplar retrieval. We test the model's distinct predictions for judgment accuracy and familiarity judgments in a judgment task requiring both knowledge abstraction and exemplar retrieval. In sum, a learning model integrating knowledge abstraction and exemplar retrieval may provide a suitable tool for understanding learning processes in judgment.

Sources of task prioritization: The interplay of response modalities and task order

Mareike Amelie Hoffmann, Aleks Pieczykolan & Lynn Huestegge
University of Würzburg, Department of Psychology
mareike.hoffmann@uni-wuerzburg.de

When two tasks are executed at once, performance typically suffers from longer reaction times and higher error rates. These dual-task costs are often distributed asymmetrically among tasks—a finding that has been suggested to result from task order in a "first come, first served" manner due to a cognitive bottleneck based on the temporal prioritization of Task 1. Interestingly, in the multitasking literature mostly a restricted range of response modalities has been employed for studying cognitive processing in dual-task control. However, in recent studies we observed substantial differences in dual-task performance based on response modality characteristics. We interpret these effects in terms of an ordinal prioritization structure among response modalities that cannot be explained with serial "first come, first served" accounts. While previous results were observed in dual-task settings with equal stimulus priorities (simultaneous stimulus presentation), in the present study we aim at dissociating two potential sources of task prioritization: Temporal (bottom-up) prioritization based on task order and (top-down) prioritization based on response modality characteristics. Therefore, we compare dual-task performance across response modalities in the PRP paradigm (sequential stimulus presentation). Our results strongly indicate to consider characteristics of the response modality in dual-task control theories additionally to temporal task priorities.

Beyond mean comparisons: a model based process-level comparison of online and laboratory based experimental data

Luisa Horsten, Felix Henninger & Benjamin E. Hilbig
University of Koblenz-Landau, Cognitive Psychology
hors6866@uni-landau.de

In many experiments, multiple psychological processes can account for the same observed pattern of outcomes. However, if one only considers measurement-level operational statistics (such as reaction time means), their effects can hardly be differentiated from those of mechanisms underlying a specific task (e.g. experimental conditions). Instead, latent cognitive processes and extraneous delays can be revealed by careful decomposition, for example through cognitive modeling. We apply this insight to context effects in laboratory- vs. online-based data collection of two-choice response time tasks, where recent reports have not found effects of setting on aggregate reaction times measures, suggesting equivalence at least at the level of measurement. Using a diffusion model we reanalyze existing data to examine whether this conclusion can be extended to the level of parameters that capture underlying cognitive processes. Based on our findings, we discuss more generally the extent to which surface-level measurements allow for inferences to the underlying cognitive processes.

Multitasking in the perihand space: Effects of stimulus-hand proximity on between-task shifts at the bottleneck

Thomas Hosang[1], Rico Fischer[2], Jennifer Pomp[3] & Roman Liepelt[1]
[1]German Sport University, Institute of Psychology; [2]University of Greifswald, Institute of Psychology; [3]University of Muenster, Institute of Psychology
t.hosang@dshs-koeln.de

Single-task studies indicate that visual processing is altered in the perihand space. Whether hand proximity alters multitasking performance is currently unknown. We performed a series of three experiments testing if stimulus-hand proximity influences between-task shifts at the bottleneck. In all experiments subjects had to execute a dual task with varying stimulus-onset asynchrony. Task 1 (numerical judgment) had to be performed with task priority and Task 2 (color judgement) had to be performed subsequently. Hands were placed either on the side of a computer screen (hands near) or on the lap (hands far). In Experiment 1, both stimuli were separately presented on the right (Task 1) and left side (Task 2) of the screen. In Experiment 2, a single bivalent stimulus was presented centrally, both tasks referring to different stimulus features. In Experiment 3, the combined stimulus could appear on both sides. In all three experiments, we found evidence of the typical psychological refractory period (PRP) effect, but no impact of hand proximity on the size of the PRP effect. Together, these findings indicate 1) the general robustness of the PRP effect and 2) that stimulus-hand proximity does not alter the shifting process between two tasks.

Support for the prediction hypothesis of visual stability: Invalid peripheral preview increases the fixation-locked N170 face inversion effect

Christoph Huber-Huber, Clayton Hickey & David Melcher
CIMeC, University of Trento
christoph.huberhuber@unitn.it

One explanation for the world's stable appearance despite saccadic eye movements is that the efference copy of the motor plan enables predictions about what will be perceived after the saccade. If so, then a violation of this prediction should be detrimental to post-saccadic perceptual processing. We investigated this hypothesis with a peripheral preview paradigm using combined EEG and eye-tracking. Participants made cued saccades to one of two lateral upright and/or inverted faces. During the saccade, the faces could change their orientation (invalid preview) or remain the same (valid preview). Consistent with the idea that valid predictions facilitate perception, a whole-scalp analysis of the post-saccadic EEG showed that the initial phase of the fixation-locked response was dominated by the preview face orientation. The target face orientation began to modulate this effect around 100ms. Invalid previews lead to more pronounced P1, N2, and N170 components than valid previews. These effects appeared to have behavioral consequences. Target face tilt performance was better in valid compared to invalid preview conditions. The results are consistent with the idea that predictions are created from peripheral previews prior to the saccade, improving the efficiency of post-saccadic processing as measured both by behavior and evoked responses.

Numerosity estimation benefits from transsaccadic information integration

Carolin Hübner & Alexander C. Schütz
Philipps-Universität Marburg
carolin.huebner@uni-marburg.de

Humans achieve a stable and homogeneous representation of their visual environment, although visual processing varies across the visual field. Here, we investigated under which circumstances peripheral and foveal information is integrated for numerosity estimation across saccades. We asked our participants to judge the number of black and white dots on a screen. Information was presented either in the periphery before a saccade, in the fovea after a saccade, or in both areas consecutively to measure transsaccadic integration. We used a maximum-likelihood model to predict accuracy and reliability in the transsaccadic condition based on peripheral and foveal values. We found near-optimal integration of peripheral and foveal information, consistently with previous findings about orientation integration. In a consecutive experiment, we disrupted object continuity between the peripheral and foveal presentation to probe the limits of transsaccadic integration. Even for global changes on our numerosity stimuli, no influence of object discontinuity was observed. Overall, our results suggest that transsaccadic integration is a robust mechanism that also works for complex visual features such as numerosity and that is operative despite of internal or external mismatches between foveal and peripheral information. Transsaccadic integration facilitates an accurate and reliable perception of our environment.

Alternativer Navigationskonzepte für Radfahrer: eine Usability-Studie

Anja Katharina Huemer, Ulla Willrodt & Mark Vollrath
Technische Universität Braunschweig, Institut für Psychologie, Ingenieur- und Verkehrspsychologie
a.huemer@tu-braunschweig.de

Fahrrelevante Navigationsinformationen können ohne sicherheitskritische Ablenkung vermittelt werden, wenn weder eine kognitive Beanspruchung noch eine Blickabwendung von der Straße zur Wahrnehmung notwendig wird. Ziel der vorliegenden Studie ist es, ein fahrradspezifisches Navigationssystem, welches diese Anforderungen erfüllen soll, auf dessen Effektivität, Effizienz und Akzeptanz in einer Probandenstudie im Fahrrad-Fahrsimulator zu prüfen. Bei dem innovativen System werden die Richtungsinformationen (rechts, links, geradeaus) durch weiß blinkende LED-Leuchten an beiden Seiten des Lenkers peripher wahrnehmbar vermittelt. Es werden Fahr- und Blickdaten sowie das Nutzerfeedback erfasst und mit drei weiteren Bedingungen verglichen: Klassische Display-Navigation, Kombinations-Bedingung (LED und Display) und eine zweite LED-Navigation ohne die Instruktion vorab, die Informationen möglichst peripher wahrzunehmen. Die Auswertung zeigt, dass in der LED peripher-Bedingung seltener der falsche Weg gewählt wurde als in der Klassischen Display-Bedingung. Darüber hinaus sind die Gesamtdauer der Blickabwendungen von der Straße, die Gesamtdauer der Fixationen auf die Navigationsanzeige (LED-Leiste oder Display) und die Blickfrequenzen auf Straße und Anzeige in der LED peripher-Bedingung signifikant geringer als in jeder der drei anderen Bedingungen. Das Nutzerfeedback ist zudem signifikant besser als in der Klassischen Display-Bedingung. Die Resultate verdeutlichen, dass eine LED-Navigation effektiv (korrekte Wahl des Weges) und effizient (weniger Blickabwendung) ist und von den ProbandInnen positiv bewertet wird.

Emotion-Evoked Central-Peripheral Trade-off Effects: Sensory gating and recall

Lana Husagic & Arianne Herrera-Bennett
Ludwig Maximilian University, Psychology
lana.husagic@gmail.com

Central-peripheral trade-off effects are well-documented within emotion literature, and have been explored in relation to the concept that facial expressions possess discrete functional and adaptive effects on sensory gating (Farb et al., 2013): While fear broadens one's perceptual scope to optimally identify danger, anger narrows intake toward the angry face itself wherein originates the threat. Moreover, retention for contextual details, at the expense of central information, was found to be greater in the presence of fear faces, and vice-versa for angry (Davis et al., 2011). Building off this framework, the current work appealed to the crossmodal integration methodology, to i) replicate how expressivity from central (facial) and peripheral (vocal) sources can bias perceptual intake, and ii) investigate potential trade-off effects of central-peripheral content recall, as a function of each discrete emotion (happy/angry/neutral). Participants underwent 2 blocks (36 audiovisual trials) tasked to classify emotion within the face (2 force-choice- alternatives); fully-crossed design with 2 within-subject factors: Face (H/A/N) x Voice (H/A/N), and counterbalanced recall blocks. 2-way repeated-measures ANOVA and post-hoc contrasts demonstrate facilitatory effects of emotional congruency on speed and accuracy of emotion identification. Trade-off effects contribute to the understanding of emotional sensory integration as a mechanism underlying altered peripheral semantic content retention.

Cue value discriminability moderates learning and generalization in evaluative cue conditioning

Mandy Hütter & Katharina Theresa Berger
Eberhard Karls Universität Tübingen
mandy.huetter@uni-tuebingen.de

Generalization can occur via the similarity of stimuli to a valent stimulus in a multi-attribute space or along a cue dimension that is related to valence. Evaluative cue conditioning (ECC) refers to the change in liking of stimuli that share a feature that is correlated with valence. In the present talk, I focus on the moderators of ECC and generalization to new instances that share the conditioned cue. Specifically, we manipulated the cue values' discriminability by contrasting them with other moderate or other extreme cue values. Across two experiments, we demonstrate that the strength of learning depends on this factor, so that a broader range of cue values results in stronger effects on evaluative ratings and contingency judgments. We also demonstrate that transfer effects are larger with a broad rather than a small range used for learning. In summary, ECC appears to be a function of the cue values present in a given environment. Theoretical and practical implications of this work will be discussed.

Adaptation of depth ordering preferences during motion transparency

Byung-Woo Hwang & Alexander C. Schütz
Philipps-Universität Marburg, Allgemeine und Biologische Psychologie
hwang@uni-marburg.de

Previous studies revealed that there are idiosyncratic depth order preferences to perceive certain motion directions in front during motion transparency depth rivalry (Mamassian & Wallace, 2010; Schütz, 2014). We investigated whether the adaptation of stereoscopic motion alters individuals' depth order preferences. In the pre-adaptation phase, we measured depth order preferences for each participant during motion transparency. The transparent motion consisted of two opposite motion directions of coherently moving dots and participants had to report which motion direction they perceived in front. In the adaptation phase, stereoscopic motion adaptation was embedded in each trial before measuring depth order preferences. The adaptor comprised of two opposite motion directions with negative and positive disparities in which the motion direction at the front coincided with the preferred direction measured in the pre-adaptation phase. In the post-adaptation phase, we measured depth order preferences in the same manner as in the pre-adaptation phase. After adaptation, the preferences of some participants rotated strongly away from their original preference. The remaining participants showed a distortion of their preference function close to the adapted direction with little rotation from their original preference. These results imply that there could be two qualitatively distinctive consequences of stereoscopic motion adaptation.

Frustration-aware cars. Application and constraints for in-vehicle frustration recognition

Klas Ihme, Meng Zhang & Uwe Drewitz
German Aerospace Center, Institute of Transportation Systems, Department of Human Factors
klas.ihme@dlr.de

Frustration is frequently experienced by persons inside a car, for example during dense traffic preventing fast driving or when system functionality does not work as intended. A frustrated driver's perception may be negatively influenced and s/he might get aggressive leading to decreased traffic safety. Furthermore, experiencing frustration has also a negative impact on comfort and therefore is even still relevant when humans are not in control anymore, but are rather users or passengers of automated vehicles. Therefore, from a human factors perspective it appears useful to equip future cars with the capability to recognize the current frustration level of the humans inside the car, appropriately react to it and by that help to balance their affective state as well as mitigate the negative effects of frustration. In our talk, we will present the results of several driving simulator studies investigating behavioral and (neuro-) physiological indicators of frustration that can be used to enable automated recognition of frustration. In addition, we will discuss the next steps towards fully frustration-aware vehicles and propose strategies how intelligent vehicles could adapt to the current level of frustration of people in the car.

A Sampling Approach to Evaluative Conditioning

Max Ihmels & Mandy Hütter
Eberhard Karls Universität Tübingen
max.ihmels@uni-tuebingen.de

In evaluative conditioning (EC), a conditioned stimulus (CS) is paired with positive or negative unconditioned stimuli (US) and consequently acquires US valence. Typically, in EC paradigms, participants have no control over the information they receive. We overcome this shortcoming by introducing sampling into the EC paradigm. We repeatedly give participants control over which CSs they want to sample (i.e., for what CSs they want to see conditioning trials). One half of the available CSs is paired positively, while the other half is paired negatively. We also include a yoked condition, in which participants get to see equivalent information to the sampling condition (i.e. same number of conditioning trials for different CSs), but do not get to make any decisions. In two experiments, we find that a preference for sampling positively over negatively paired CSs develops over time. We find stronger EC effects in the sampling than in the yoked condition and also find evidence for stronger EC effects for larger numbers of CS-US pairings. Further, we find that higher numbers of interactions lead to more positive evaluation changes, but only in the sampling and not in the yoked condition. Implications for the ecological validity of EC paradigms are discussed.

From motor learning to exergaming for motor rehabilitation of neurological movement disorders

Winfried Ilg
Hertie Institute for Clinical Brain Research, University Clinic Tuebingen
winfried.ilg@uni-tuebingen.de

In this talk, I will present our work on exergaming and VR in patients with neurological movement disorders. Exergaming have shown to be a motivating approach to realize effective motor training, which enable the patients to exercise at home with high training intensity and in changing interactive game scenarios, which allow the individual adjustment and gradual increase of training complexity. VR approaches with head mounted display delivers the interesting possibility, to manipulate the environments in specific ways and thus to investigate reactive and adaptive behaviour of neurological patients to these manipulated environments. In order to examine the behaviour of patients in such environments, we combine head mounted displays with online motion tracking of the whole body or the hands. Potential applications will be discussed on the examples of stroke patients which present impairments in the perception of the vertical axis or which neglect motor behaviour of one body despite of sensomotoric functioning.

Assessment tool for measuring a driver's willingness of interaction

Jonas Imbsweiler, Jeanine Bachmann, Julius Braun, Tobias Weyer & Barbara Deml
Karlsruhe Institute of Technology - ifab - Institute of Human and Industrial Engineering
jonas.imbsweiler@kit.edu

A lot of research questions afford to gain a deeper insight into the interaction behavior of car drivers. Unfortunately, when doing research in a driving simulator, a measurement tool for classifying the driving style on a continuum of offensive and defensive behavior is missing so far. Within this work a testing procedure based on the driving simulation SILAB was developed and pretested by N=34 subjects. It contains ten driving maneuvers (e.g. driving through a coequal-narrow-passage), in which drivers may reveal a distinct cooperation behavior. Each situation was assessed (0 for rule-consistent-behavior, +1 for rule-inconsistent-offensive-behavior, -1 for rule-inconsistent-defensive-behavior). On the basis of the sum, the overall interaction-style was derived. Four situations had to be removed as all subjects behaved the same and thus, these stimuli did not reveal to be selective. The results show that the situations differ ($F(1,5)=160.469, p<.000, ?^2=.925$). The overall driving behavior was not rule-consistent as the derived sum differs from the value 0 in a highly significant manner ($t(34)=-11.414, p<.000, M=-1.353, SD=.691$). In further studies the testing procedure shall be improved in order to allow for testing more traffic situations. The relationship between the observed driving style and further personality traits as well as further interaction behavior shall be studied in detail.

The effect of auditory stimuli in visual search task

Orsolya Inhóf, András Norbert Zsidó, Gergely Darnai, Beatrix Lábadi & György Révész
University of Pécs
inhof.orsolya@gmail.com

Large body of research found that auditory signals could induce faster detection. It has also been shown that auditory information could affect the processing of the visual stimuli, and vice versa, the visual information could affect auditory processing. The dominant modality hypotheses explain this asymmetry between the modalities; and are based on detection tasks. However, previous studies did not concerned how the different properties of stimulus (e.g. discontinuity, reliability) affect the success of integration in attention tasks. We used a visual search task, to examine the dominant modality hypotheses. Participants heard auditory signals on the same or opposite side compared to the visual target stimuli. In Experiment 1, we used different auditory stimuli (continuous, floating and moving). While in Experiment 2, participants learned the connection between the two modalities before conducting the same task as in Experiment 1. Our results showed that acoustic information did not affect visual search performance. The discontinuity of the sound would not increase the probability of integration; even after practice. Participants detected the target on either side of the auditory stimuli equally as quick, even in the integration facilitating conditions. Our results suggest the dominant modality hypotheses can only be used in detection tasks.

The influence of sequential structure and temporal effect predictability on dual-task interference

Monno Irina[1], Fang Zhao[2], Robert Gaschler[3] & Thomaschke Roland[1]
[1]Albert-Ludwigs-Universität Freiburg, Institut für Psychologie Allgemeine Psychologie: Cognition, Action, and Sustainability; [2]FernUniversität in Hagen, Institut für Psychologie, LG Allgemeine Psychologie, LME; [3]FernUniversität in Hagen, Institut für Psychologie, LG Allgemeine Psychologie LME
irina.monno@psychologie.uni-freiburg.de

Compared to single tasks, multitasking often impairs performance. Previous research has shown that this impairment can be reduced by various kinds of predictabilities within the tasks. The present study focuses on whether predictability of sequential structure or temporal predictability of action effects influences dual-tasking. Previous research suggested that implicit sequence learning, as well as action effect anticipation, and dual-task interference, are all strongly related to the response selection stage in action processing. Thus, we hypothesized an interacting effect from sequence and effect timing on dual-tasking. Participants did a spatial detection 4 choice task which was sequentially ordered. Three sequences were presented, one of them was the most occurred. Simultaneously they did a 2 choice digit identification task which was always randomly ordered. We manipulated between subjects whether the target stimulus disappeared constantly delayed after the first task response, constantly delayed after the second task response, or randomly delayed after the first or second task response. Neither temporal effect predictability, nor sequential structure significantly reduced dual-task interference, although the sequential structure was learned. Relations to contrasting findings in previous research are discussed.

Measures to integrate speed and accuracy: A critical assessment and evaluation of their validity, utility, and problems

Markus Janczyk[1] & Heinrich René Liesefeld[2]
[1]Eberhard Karls University of Tübingen, Department of Psychology; [2]Ludwig-Maximilians-Universität München, Department Psychologie and Graduate School of Systemic Neurosciences
markus.janczyk@uni-tuebingen.de

In psychological experiments, participants are typically instructed to respond as fast as possible without sacrificing accuracy. How they interpret this instruction and, consequently, which speed-accuracy tradeoff they chose, might vary between experiments, between participants, and between conditions. Consequently, experimental effects can appear unpredictably in either RTs or error rates. Even more problematic, spurious effects might emerge that are actually due only to differential speed-accuracy tradeoffs. An often suggested solution is the inverse efficiency score (IES; Townsend & Ashby, 1978), which combines speed and accuracy into a single score. Alternatives are the rate-correct score (RCS; Woltz & Was, 2006), the linear-integrated speed-accuracy score (LISAS; Vandierendonck, 2016), and the Balanced Integration Score (BIS; Liesefeld, Fu, & Zimmer, 2015), which was devised to integrate speed and accuracy with equal weights. We report analyses on simulated data generated with the standard drift-diffusion model showing that IES, RCS, and LISAS put unequal weight on speed and accuracy (even depending on the accuracy level) and that these measures are actually very sensitive to speed-accuracy trade-offs. BIS strongly (but not fully) attenuates SAT effects. Critical aspects of using either of these measures are discussed against the background of undesired research strategies and their general applicability.

Considering sustainability in buying decisions: The role of altruism and materialism

Jennifer Janeczko[1], Gerrit Stöckigt[1] & Matthias Brand[2]
[1]University of Duisburg-Essen, Department of General Psychology: Cognition and Center for Behavioral Addiction Research (CeBAR); [2]General Psychology: Cognition and Center for Behavioral Addiction Research (CeBAR) Erwin L. Hahn Institute for Magnetic Resonance Imaging
jennifer.janeczko@stud.uni-due.de

Decision-making processes in the context of offline and online shopping are very complex. Besides many other shopping motivations, sustainability is a topic of emerging interest that should be considered in buying decisions. Although several studies have examined the influence of sustainable aspects on the decision-making process, little is known about the factors that could influence the extent to which sustainability is considered in shopping situations. Even if the effects of characteristics like altruism and materialism have already been discussed for environmentally responsible behavior, it remains unclear whether both factors influence the consideration of sustainability in buying decisions. Therefore, the current study (N = 154) tested the interaction of these components in a structural equation model. Results indicate that the effect of altruism on the consideration of sustainability in buying decisions is mediated by materialism. Consequently, altruism and materialism seem to be important characteristics for the extent to which sustainability is considered in buying decisions. Thus, encouraging altruistic tendencies while trying to decrease materialistic values in society might lead to a higher consideration of sustainability in shopping situations. As a result, it could become more likely for consumers to show sustainable behaviors in general.

It's just a matter of focus: distractor processing in a multisensory flanker task is modulated by gaze

Anne Jensen[1], Simon Merz[1], Charles Spence[2] & Christian Frings[1]
[1]University of Trier, Cognitive Psychology; [2]University of Oxford, Crossmodal Research Laboratory
jensen@uni-trier.de

In daily life, people integrate signals from different sensory modalities in order to create multisensory objects. Further, relevant objects need to be selected against a background of irrelevant signals. In this context, an important and controversial discussed question is whether attention is needed for integration. We designed a flanker task where both target and distractor were multisensory (each stimulus had a visual and an auditory feature) and the congruencies of the target and distractor features were varied orthogonally. Further, we manipulated participants' focus of gaze in order to vary the amount of attention distributed to the distractor. People fixated either the target or the distractor object. In both cases, the distractor produced interference based on congruency. Interestingly, we found a modulation of the multisensory integration process for the irrelevant distractor by gaze: when the distractor was fixated we found an interaction between the congruencies of the two distractor features, when not fixated we found no interaction but just additive congruency effects. So in a truly multisensory selection situation, attention seems necessary for multisensory integration. When the distractor is inside of gaze, distractor processing changes from a feature-based to an object-based processing.

Neural responses to outcome error prediction: the impact of self-induced and externally-manipulated motor errors

Michael Joch, Mathias Hegele, Heiko Maurer, Hermann Müller & Lisa K. Maurer
Justus-Liebig-University, Department of Sport Science
michael.joch@sport.uni-giessen.de

In this study, we tested neural responses related to error-prediction (error-related-negativity, ERN) and result-feedback reaction (feedback-related-negativity, FRN) in self-induced versus externally manipulated errors, committed in a semi-virtual target throwing task. So far, 18 participants practiced the motor task for two days. Afterwards, EEG recordings were conducted on three consecutive days in which roughly every 20th target hit was manipulated to a target miss (exError). With respect to error-prediction, we found medium sized effects in the mean-amplitude of the ERN comparing target hits with errors (d = .45) and exErrors (d = .58), respectively, and only small effects comparing hits and the manipulated exErrors (d = .19). Looking at the result-feedback reaction, we found a FRN in externally-manipulated (d = 1.28) and self-induced (d = .85) errors. In detail, there was a higher FRN amplitude in externally-manipulated than in self-induced errors (d = .47). Our results indicate that an ERN can only be observed in trials where self-induced errors were committed. This validates the assumption that the ERN is a neural correlate of motor error-prediction. Lastly, the amplitude of FRN seems to depend on whether the motor system has predicted an error in the ongoing trial.

Part-List Cuing Impairment in Children: The Role of Encoding

Thomas John & Alp Aslan
Martin Luther University Halle-Wittenberg, Department of Psychology
thomas.john@psych.uni-halle.de

Providing a subset of previously studied items as a retrieval cue can impair recall of the remaining items. Recent work has revealed that such part-list cuing (PLC) impairment depends on encoding, being lasting with low associative encoding, but transient with high associative encoding. Here, we investigated the role of encoding in children's PLC. 7-8, 9-11, and 13-14 year-olds learned word lists using either a single study trial (low associative encoding) or two study-test trials (high associative encoding). Thereafter, two successive recall tests were administered, with PLC occurring in the first but not the second test. The persistence of PLC impairment was inferred from its presence/absence in the second test. Consistent with previous adult findings, the oldest age group showed lasting PLC with low associative encoding, but transient PLC with high associative encoding. In contrast, the two younger age groups showed lasting PLC regardless of encoding. The current findings indicate that older but not younger children's PLC depends on encoding. In particular, following the suggested view that lasting PLC reflects retrieval inhibition, and transient PLC reflects strategy disruption, the results indicate that inhibition and strategy disruption mediate PLC in older children, whereas inhibition alone mediates PLC in younger children.

When predictive coding impedes perception

Ellen Joos[1] & Jürgen Kornmeier[2]
[1]INSERM U1114, Cognitive Neuropsychology and Pathophysiology of Schizophrenia, University of Strasbourg; University of Freiburg, Medical Center, Department of Psychiatry and Psychotherapy; Institute for Frontier Areas of Psychology and Mental Health, Perception and Cognition Group; [2]University of Freiburg, Medical Center, Department of Psychiatry and Psychotherapy; Institute for Frontier Areas of Psychology and Mental Health, Perception and Cognition Group
juergen.kornmeier@uni-freiburg.de

The information available to our senses is restricted and to varying degrees ambiguous. Our perceptual system applies memorized concepts in order to resolve current ambiguities and to anticipate the "perceptual future" (predictive coding). We recently identified two ERP components, reflecting the ambiguity of both a currently and a previously perceived stimulus. In the current study we tested whether these ERPs are also sensitive to the ambiguity of a highly predictive upcoming visual stimulus. We presented ambiguous Necker cubes and disambiguated cube variants in pairs and varied ambiguity of the first (S1) and second (S2) stimulus in four separate conditions. Participants indicated their percept of S1, and identical or changed percepts of S2 compared to S1. Corresponding EEG traces and reaction times were analyzed. The ERP amplitudes to S1 reflect the ambiguity of both the current S1 and the upcoming S2. Reaction times, in contrast, increased when the stimulus quality changed from S1 to S2, regardless of the change direction. Our results indicate that perceptual processing of the presence automatically implies predictions about the immediate future. While this predictive coding strategy may be overall advantageous to resolve the pervasive perceptual problem, it can become disadvantageous in certain situations.

Age and individual differences in visual working memory: the role of trial-by-trial fluctuations in attentional control

Kerstin Jost[1], Atsushi Kikumoto[2], Tina Schwarzkopp[3] & Ulrich Mayr[2]
[1]Brandenburg Medical School, Psychology; RWTH Aachen University, Institute of Psychology; [2]University of Oregon, Department of Psychology; [3]RWTH Aachen University, Institute of Psychology
kerstin.jost@mhb-fontane.de

Working memory (WM) varies across individuals and declines with age. Recent evidence suggests that for individual differences in WM performance, the consistency of attentional control turned out to be a relevant predictor. We here investigated whether trial-by-trial fluctuations in WM performance do also contribute to the overall smaller capacity estimates in older adults. We measured performance fluctuations in a visual WM task with a whole-report procedure that allows tracking the number of stored items in each trial. In accordance with previous findings, younger adults differed substantially in performance consistency: Individuals, who scored low in a standard WM task (low-capacity individuals) showed more performance failures than high-capacity individuals even though they performed equally well in a large proportion of trials. Thus, fluctuations in attentional control seems to be a major factor for individual differences rather than the storage capacity per se. In contrast, for the elderly at least some individuals exhibited a performance pattern that better fits with a capacity decline going beyond mere attentional failures. Thus, our findings suggest that both variations in the consistency of attentional control as well as variations in WM capacity contribute to the individual differences in WM performance of older adults.

Influence of tool-use experience on motor planning

Bianca Jovanovic & Gudrun Schwarzer
Justus-Liebig-Universität Giessen, FB 06, Developmental Psychology
bianca.jovanovic@psychol.uni-giessen.de

We investigated how learning to use an unfamiliar tool by applying a specific grip influences children's performance on grip choice in a rotation task assessing end-state comfort planning. Two groups of children were trained to use one of two different grips –thumb-up or thumb-down- on a bar to accomplish a task. Before and after training, children were required to rotate the bar and we analysed in how far they would adopt an awkward initial hand orientation (thumb-down grip) to insure a comfortable posture at the end of the rotation (end-state comfort effect). Results indicate that children produced more awkward thumb-down grips on the rotation task when they had trained to use the tool applying this specific grip, and less if they were trained on using an incongruent thumb-up grip. This demonstrates how motor history implicated in a tool-use task influences efficient action planning.

Increasing Reward Prospect Motivates Switching to the More Difficult Task: A Case of Motivation Efficiency?

Vanessa Jurczyk[1], Kerstin Froeber[1] & Gesine Dreisbach[2]
[1]University of Regensburg, Chair for General and Applied Psychology (Prof. Dr. Dreisbach); [2]University of Regensburg, Chair for General and Applied Psychology
vanessa.jurczyk@psychologie.uni-regensburg.de

In daily life we are often confronted with changing tasks of different task difficulty. How does our current motivational state influence which task we would choose in a given situation? Diverse psychological theories suggest a direct link between motivation and task difficulty, namely a dynamic increase in motivation with increasing task difficulty. Here we test whether this is a reciprocal relationship: That is, does a higher motivational state bias participants' decision in favor of the more difficult of two tasks? In a series of three voluntary task switching experiments, reward magnitude (low vs. high) was varied randomly between trials while participants could choose between an easy and a difficult task. Recent research from our lab has shown that an increase in reward prospect is associated with a higher proportion of voluntary switches (Fröber & Dreisbach, 2016). Thus, here we hypothesized that the increase in reward prospect should especially promote voluntary switches to the more difficult task. The results of all three experiments confirmed this prediction, suggesting that participants avoid wasting the higher motivational arousal going along with increasing reward prospect on the easier task. The results will be discussed in light of recent theorizing on effort-based decision making.

Sensory attenuation of self-produced signals is driven by motor-independent predictions

Jakob Kaiser & Simone Schütz-Bosbach
Ludwig-Maximilian University, Experimental Psychology
J.Kaiser@psy.lmu.de

Sensory events produced by ourselves are known to lead to lower neural and perceptual impact than sensory events from other environmental sources. This sensory attenuation is assumed to result from control processes generated within the motor system, potentially helping us to distinguish effects produced by oneself and others. However, previous research cannot rule out that self-produced events are in fact attenuated due to motor-independent predictive mechanisms, which just highlight other-produced events due to lower predictability of their onset and thus higher surprise. By measuring the auditory-evoked N1 in an EEG experiment we show that self-generation of sounds only leads to cortical attenuation when the onset of other-generated sounds is less predictable due to the absence of any predictive cues. The presence of a preceding cue predicting the onset of auditory stimuli, in contrast, led to a reversal of the attenuation effect, with lower N1 amplitudes for other-generated sounds in contrast to self-generated sounds. Thus, contrary to prevalent assumptions sensory attenuation is not bound to self-generation per se, but appears to be the result of motor-independent mechanisms. These results shed new light on the role of motor control and predictive mechanisms for the processing of self- and other-produced sensory signals.

Semantics determine the influence of allocentric information in memory-guided reaching

Harun Karimpur & Katja Fiehler
Justus Liebig University Giessen, Experimental Psychology
harun.karimpur@psychol.uni-giessen.de

Interacting with objects requires us to represent spatial configurations in our environment. The extent to which we encode objects for action relative to other objects (allocentrically) is determined by contextual factors such as spatial object clusters and task-relevance. In a memory-guided reaching task in virtual reality, we investigated whether objects that are not spatially but semantically clustered also determine the influence of allocentric information. We placed objects from different semantic clusters on a table. Participants encoded the objects while freely exploring the scene. After a brief mask and a delay, the scene was briefly shown again (test scene) with one object missing. Participants were asked to reach to the location of the missing object (reaching target) from memory on an empty table. In the test scene, two objects which either belonged to the same (congruent) or a different (incongruent) semantic cluster as the reaching target were shifted. In the baseline condition, no object shift occurred. Reaching endpoints deviated in the direction of object shifts. These errors were larger when semantically congruent as opposed to incongruent objects were shifted. We argue that humans integrate higher-level information when interacting with objects. Semantic clustering could be an efficient mechanism of representing objects for action.

Visuelle und akustische Ablenkung bei jungen und älteren Autofahrern im Fahrsimulator – eine EEG-Studie

Melanie Karthaus, Edmund Wascher & Stephan Getzmann
Leibniz Research Centre for Working Environment and Human Factors (IfADo), Department of Ergonomics
karthaus@ifado.de

Ablenkung ist ein großes Problem für die Verkehrssicherheit. Autofahrer sind einer Reihe von akustischen und visuellen Ablenkreizen ausgesetzt, die ihnen während der Fahrt innerhalb und außerhalb des Autos begegnen. Während einige dieser Reize wichtige Informationen enthalten und sogar verhaltensrelevant sein können, sind andere Reize irrelevant und müssen ausgeblendet werden. Die Fähigkeit zur Inhibition irrelevanter Reize kann jedoch mit zunehmendem Alter beeinträchtigt sein. In der vorliegenden Studie untersuchten wir die Auswirkungen von akustischen und visuellen Ablenkreizen während einer Fahrt im Fahrsimulator bei jungen (18-25 Jahre) und älteren (55-65 Jahre) Autofahrern. Hierzu wurden Verhaltensdaten und neurophysiologische Maße (EEG) in einer Fahraufgabe erfasst, bei der auf Seitenwind und Bremslichter voranfahrender Fahrzeuge zu reagieren war. Visuelle Ablenkreize verursachen in beiden Altersgruppen längere Reaktionszeiten als akustische Reize. Während die Spurhaltung der beiden Altersgruppen ähnlich gut ist, zeigen sich eher Unterschiede in der Bremszeit und der Anzahl der Fahrfehler, die bei den Älteren jeweils größer ausfallen. Darüber hinaus zeigt sich, dass die ereigniskorrelierten Potenziale, welche die kognitive Verarbeitung der fahrrelevanten Reize abbilden (P3), durch die Ablenkreize kleiner werden und dies vor allem in der Gruppe der älteren Autofahrer. Die Ergebnisse werden im Rahmen der Theorie multipler Ressourcen und der Inhibitionshypothese diskutiert.

Personal time-related life events influence the direction of whole-body movements

Lydia Kastner[1], Jennifer Müller[2], Juan José Rahona López[1], Peter Gerjets[1] & Susana Ruiz Fernández[1]
[1]Leibniz Institut für Wissensmedien, Multimodal Interaction Lab; [2]Eberhard Karls University of Tübingen, LEAD Graduation School & Research Network
l.kastner@iwm-tuebingen.de

Grounded cognition literature suggests that the abstract concept of time is associated with the more concrete concept of space (i.e., past association with backward and left; future association with forward and right). A recent study also indicates that the past is associated with backward whole-body movements, whereas the future is associated with forward whole-body movements. Language metaphors like "to leave the past behind" or "to approach the future" also support this association. But can time influence the decision on where to move? To answer this question, 71 participants had to place 9 past-related and 9 future-related personal life events on a square mat by performing free whole-body movements. Participants could place their life events by moving to 8 possible directions (i.e., forward-backward, left-right, and diagonal movements). Results showed that future life events were more often associated with forward whole-body movements than past life events. In contrast, past life events were more often associated with backward movements than future life events. Additionally, a preference for a diagonal association of time was found, showing that future life events were more often associated with forward-right whole-body movements and past life events more often with backward-left movements.

Individual Alpha Frequency Relates to the Sound-Induced Flash Illusion

Julian Keil[1] & Daniel Senkowski[2]
[1]Christian-Albrechts-Universität Kiel, Biologische Psychologie; [2]Charité - Universitätsmedizin Berlin, Klinik für Psychiatrie und Psychotherapie
julian.keil@gmail.com

Ongoing neural oscillations reflect fluctuations of cortical excitability. A growing body of research has underlined the role of neural oscillations for stimulus processing. Neural oscillations in the alpha band have gained special interest in electrophysiological research on perception. Recent studies proposed the idea that neural oscillations provide temporal windows in which sensory stimuli can be perceptually integrated. This also includes multisensory integration. In the current high-density EEG-study we examined the relationship between the individual alpha frequency (IAF) and cross-modal audiovisual integration in the sound-induced flash illusion (SIFI). In 26 human volunteers we found a negative correlation between the IAF and the SIFI illusion rate. Individuals with a lower IAF showed higher audiovisual illusions. Source analysis suggested an involvement of the visual cortex, especially the calcarine sulcus, for this relationship. Our findings corroborate the notion that the IAF influences the crossmodal integration of auditory and visual stimuli in the SIFI.

Contextualising information enhances the experience of environmental art

Anna Keller & Florian Röser
University of Applied Sciences, Economic Psychology
florian.roeser@h-da.de

Environmental communication is a challenging job. Environmental problems such as climate change or pollution often feel distant, hard to grasp, and temporally removed, making it difficult to create awareness and motivate pro-environmental behaviour. Traditional methods (e.g. information campaigns) have struggled to find enduring success, leading to alternative methods being tested. Environmentally-themed art is among those being increasingly addressed in literature, with promising results. However, as researchers begin to systematically study environmental art, influencing factors must be addressed - for example, the effect of presenting contextualising information. In the present study, 123 participants saw an environmental artwork with or without contextualising information in a between-subjects design, and rated the artwork on various variables regarding its aesthetic value and pro-environmental impact. Additionally, eye movement was recorded using mobile eye tracking glasses to gain insight into the processing of the artwork. The results showed that information presentation increased personal meaning and understanding, which was in turn associated with liking, interest and the emotional response. Average fixation duration was significantly shorter (-37ms) for participants in the information group, indicating easier processing due to the guidance of the information. Implications for researchers and practitioners such as artists, curators and environmental communicators will be discussed.

Weighting of vision and proprioception in post-stroke reach planning

Johannes Keyser[1], Noël L. W. Keijsers[2], Luc Selen[1] & Pieter W. Medendorp[1]
[1]Donders Institute for Brain, Cognition and Behaviour, Radboud University; [2]Department of Research, Sint Maartenskliniek Nijmegen
j.keyser@donders.ru.nl

To plan a goal-directed reach, the brain estimates the initial hand location by weighting visual and proprioceptive signals. Sober & Sabes (2003) proposed a model of reach planning in two stages, each with different sensory weightings for hand location estimation: One weighting to determine a desired movement vector and one to generate a joint-based motor command. Fitting the model to reach data of healthy subjects revealed that the sensory weighting is shifted towards vision during movement vector planning, but shifted towards proprioception during motor command generation. In our study, we quantify the weighting of vision and proprioception for reach planning in stroke survivors and healthy controls. Participants perform a center-out reaching task, with each hand, in a virtual reality setup that allows to shift the visual feedback of the hand. We extended Sober & Sabes' model to compare the affected versus unaffected hands of stroke survivors and the dominant versus non-dominant hands of control subjects. Our preliminary results show that the sensory weightings of controls do not depend on hand dominance. We hypothesize that stroke survivors show deficient sensory weightings with their affected hand, either during movement vector computation or during motor command generation.

Frontoparietal EEG phase coupling reflects the successful memory encoding of constructed objects during maintenance in visual working memory

Patrick H. Khader[1], Frank Rösler[2] & Julia A. Ewerdwalbesloh[3]
[1]Brandenburg Medical School, Psychology; [2]University of Hamburg, Psychology; [3]Ludwig-Maximilians-Universität, Department of Psychology
Patrick.Khader@mhb-fontane.de

How are mentally constructed images maintained in visual working memory (vWM)? And does this maintenance pose a form of stimulus elaboration, promoting successful encoding into more permanent memory traces? To investigate this, we designed a subsequent-memory study in which participants maintained visual objects that they either had to construct from single parts or that were presented as complete objects. Increased fronto-parietal-occipital EEG phase coupling was generally found during the maintenance of constructed compared to non-constructed objects in the theta, alpha, and gamma frequency bands. For increased construction load, i.e., when more object parts had to be maintained, this pattern was restricted to fronto-parietal couplings, suggesting that the fronto-parietal attention network is coping with increased attentional demands involved in maintaining constructed images. Furthermore, this coupling pattern was also found for later remembered in comparison to later forgotten objects. For alpha and beta, the effect dissociated topographically for constructed vs. non-constructed objects, suggesting specific contributions to encoding depending on the kind of elaborative processing in vWM. To conclude, fronto-parietal phase coupling might be a neural implementation of an attentional control process the serves to keep object elements together as a coherent vWM representation, and, in so doing, promotes memory encoding.

Biased competition to account for task choice in self-organized task switching

Andrea Kiesel[1], Victor Mittelstädt[1] & Jeff Miller[2]
[1]Albert-Ludwigs-Universität Freiburg; [2]University of Otago
kiesel@psychologie.uni-freiburg.de

In a new variant of the voluntary task-switching procedure, we explored whether participants adapt to individual task-switching performance limitations (i.e., switch costs) when deciding between task repetitions and task switches. In this self-organized task-switching paradigm, participants see a number and a letter stimulus in each trial and they can freely decide to perform the number (smaller/larger five) or the letter (vowel/consonant) task. Critically, the stimulus belonging to the chosen task appears delayed in the next trial and this delay increases with the number of task repetitions. In the current experiments, we explored whether participants trade off switch costs against the increasing waiting time for the stimulus needed for a task repetition. Several experiments revealed that switch costs and task selections are related: The larger the switch costs, the less often participants switched tasks. These results could be explained by assuming that participants deliberately considered their individual switch costs when self-organizing their task selection behavior. Alternatively, task selection might be determined by a between-task competition that is biased by task recency and stimulus-task priming.

Design factors (I): What influences trajectory curvature in mouse-tracking experiments?

Pascal J. Kieslich[1], Martin Schoemann[2], Tobias Grage[2] & Stefan Scherbaum[2]
[1]University of Mannheim, Department of Psychology; [2]Technische Universität Dresden, Department of Psychology
kieslich@psychologie.uni-mannheim.de

The analysis of mouse movements to study cognitive processes is becoming increasingly popular in many psychological research areas. When creating mouse-tracking experiments, researchers face a number of design choices, for example, about the mouse speed, starting procedure, or response indication. In previous research, many different settings have been employed, but so far little is known about how these methodological differences affect mouse-tracking data. To address this, a series of experiments was conducted to systematically investigate the influence of multiple design factors. A classic mouse-tracking task was used for these experiments, in which participants classify typical and atypical exemplars into one of two categories. In separate experiments, the design factors response indication (click vs. touch), mouse sensitivity, screen aspect ratio, and starting procedure were manipulated between participants. Across all experiments and design conditions, the core finding that mouse trajectories deviate more towards the non-chosen option for atypical than for typical exemplars was replicated. However, the strength of this effect, the curvature and the distribution of the shape of individual trajectories was influenced by several design factors – especially by the type of starting procedure and response indication. Implications for the design of future mouse-tracking studies and possible recommendations are discussed.

PsyToolkit: Testing the replicability of web-based results in a laboratory setting

Jonathan Daniel Kim[1], Ute Gabriel[1] & Pascal Gygax[2]
[1]Norwegian University of Science and Technology, Department of Psychology; [2]University of Fribourg, Department of Psychology
jonathan.kim@ntnu.no

This research examines the replicability of response and response times obtained through a web-based instrument PsyToolkit compared to a habitual laboratory setting (using E-prime 3.0). During a cognitive-choice experiment participants were required to answer the question 'Could [first name] be one of the [role noun in plural form]' (e.g, 'Sam – Firefighter'). Thirty-six role nouns (12 masculine, 12 feminine, 12 non-stereotyped) and six names (3 males, 3 females) were utilised for this experiment. Choice (i.e., yes/no responses) was analysed through a general linear mixed-effects model, while response times were analysed through a linear mixed-effects model (with the lme4 package in R). No significant differences were found between PsyToolkit and Eprime for either choice or response times, suggesting adequate replicability. However, response times variability was considerably larger for results obtained through PsyToolkit compared to Eprime. We discuss this latter variability in terms of its implications for futur work using web-based instruments to measure response times.

How mood affects processing of emotional adjectives in L1 and L2 - an ERP study

Johanna M Kißler[1] & Katarzyna Bromberek-Dyzman[2]
[1]Bielefeld University, Department of Psychology, Affective Neuropsychology; [2]Adam Mickiewicz University, Faculty of English, Language and Communication Laboratory
johanna.kissler@uni-bielefeld.de

Processing affective language in one's second language (L2) has been suggested to be less embodied than in one's native language (L1). Addressing this issue via a mood manipulation, we investigate categorization of and ERPs elicited by positive, negative, or neutral adjectives presented either in L1 (German) or L2 (English). Participants viewed short, emotionally evocative positive or negative movie-excerpts and were then presented with series of adjectives. ERPs were recorded while participants performed a valence decision task on the words. In L1, words were categorized more often as positive or negative than as neutral, positive and negative not differing, whereas in L2 most words were categorized as positive. The N400 was larger in L1 than L2 and larger in negative than in positive mood. On the late positive potential (LPP) an interaction was found: In L1, particularly in positive mood, larger responses occurred for both positive and negative adjectives compared to neutral ones. However, in L2, across moods largest LPPs were found for positive adjectives. These results indicate reduced processing of negative content in L2, possibly as a result of less embodied processing, contributing to a growing body of cross-linguistic ERP research on emotional language processing.

Sensory Attenuation: Disentangling Expectancy and Agency Effects

Annika Laura Klaffehn, Lisa Weller, Katharina A Schwarz, Wilfried Kunde & Roland Pfister
University of Würzburg, Department of Psychology III
annika@klaffehn.net

Sensory attenuation describes the phenomenon that self-produced effects are perceived as less pronounced than external events. But can this perceptual change indeed be attributed to differences in agency or is it a by-product of the increased temporal predictability of self-produced events? Agency and predictability are oftentimes confounded in experimental studies, and we therefore present an experimental design to de-confound both variables. We measured sensory attenuation via event-related potentials (ERPs) to self-produced and externally produced tones in two settings. In a classic setting, the onset of self-produced tones was perfectly predictable whereas the onset of externally produced tones was not. In a novel, predictive setting, predictability was parallelized by cueing the onset of self-produced and externally produced tones by an informative temporal cue (a progress bar filling on the screen). The classic conditions replicated sensory attenuation effects in terms of N1 and P2 ERP components. Results from the predictive comparison still yielded some evidence for attenuation of the N1 component for self-produced relative to externally produced tones. We conclude that the N1 component of the auditory ERP is not solely dependent on certainty of tone onset but appears indeed to be sensitive to agency.

Predicting how we grasp arbitrary objects

Lina Katharina Klein[1], Guido Maiello[1], Juan Chen[2], Vivian Charlotte Paulun[1], Jody C Culham[2] & Roland W Fleming[1]
[1]Justus-Liebig University Giessen, Department of Psychology; [2]University of Western Ontario, Department of Psychology Brain and Mind Institute
Lina.K.Klein@psychol.uni-giessen.de

We investigated the computations underlying visually guided grasp selection for three-dimensional objects of non-uniform materials, and the brain areas involved in this process. In behavioral experiments, 26 participants picked up objects composed of 10 cubes (individual cubes made of wood or brass, side length 2.5 cm) in various configurations to test how an object's three-dimensional shape and material properties affect grasp locations. The results reveal that grasping is highly regular, constrained, and consistent across participants. Specifically, grasp locations are systematically affected by weight as well as mass distribution, the length of the reach trajectory, the subject's natural grip axis, and the presence of handles. We employed these findings to build a very accurate grasp selection model. Based on the model's predictions we chose new shapes onto which we pre-selected a subset of grasps designed to tease apart the different components of visual grasp selection. To study which brain areas are involved in grasping we then placed 2 participants in an fMRI scanner and recorded their BOLD activity while grasping these novel objects varying in material properties at the pre-selected grasp points. Thus, by combining behavioral data, computational modelling, and fMRI we can predict how humans grasp objects.

Efficiency and Aesthetics of E-Commerce Results

Anica Kleinjan[1] & Stefan Brandenburg[2]
[1]CONTACT Software GmbH; [2]Technische Universität Berlin, Cognitive Psychology and Cognitive Ergonomics
stefan.brandenburg@tu-berlin.de

E-commerce became more importance in recent years. About 40% of the customers' state that they prefer online shopping over retail shopping. Good user experience and a positive perception of the online shop are important factors for the success of an e-commerce business. A significant part of an online shop is the result list that appears when users search for items. The present paper examines the search efficiency and perceived aesthetics of two different e-commerce result lists, grid or list design. A grid design shows more than one item in a row and a list design has one item in a row. Grid vs. list design, number of items and the presence or absence of a target item were manipulated. Reaction times and perceived aesthetics ratings were assessed. Results show that the grid design leads to a lower reaction time than the list design. This effect is affected by the number of items shown and the presence or absence of a target. In addition, the grid design is more aesthetic than the list design regarding simplicity, versatility and artistry. The results replicate and supplement results found in previous studies.

Eye movements reveal task-driven information search in memory during sequential diagnostic reasoning

Anja Klichowicz[1], Sascha Stehlau[2], Josef F. Krems[1] & Agnes Scholz[3]
[1]Technische Universität Chemnitz, Department of Psychology; [2]University of Kassel, Department of Psychology; [3]University of Zurich, Department of Psychology
anja.klichowicz@psychologie.tu-chemnitz.de

Causal reasoning is the complex process of finding explanations for an information. The evaluation of a cause depends on a multimodal memory representation of the problem. Part of that representation has to be retrieved to find an explanation. However, it is unclear if information retrieval differs depending on the explanatory value of the new information. In an experiment (N = 29) participants solved a sequential reasoning task where critical information had to be retrieved from memory during 48 trials (Black-Box-task, Johnson & Krems, 2001). We manipulated whether it is possible to explain new evidence based on previous information. By use of eye-tracking measures, we tracked the search for information from memory. If new evidence is already explained, participants tend to look at these explanations. This is conform to the Theory of Abductive Reasoning (TAR, Johnson & Krems, 2001) which predicts that previous explanations are used to concretize an abstract hypothesis. In contrast, if evidence cannot be explained right away, participants tried to integrate the information with previous evidence resulting in more eye movements to the information location than to previous explanations. Implications to process assumptions in sequential diagnostic reasoning are discussed.

Dynamics of the mimetic crisis in students

Laura Klimecki, Markus Maier & Vanessa Büchner
LMU Munich, Department of Psychology
laura.klimecki@outlook.com

Background. According to Girard's Mimetic Theory (1979), human motivation is driven by imitative (mimetic) desires: Namely, when two individuals ("actor" & "model") realize shared interest in an item ("object") that has a finite quality. This provokes a rivalry or aggression that is preconscious in nature. The current study serves as a conceptual replication of recent work by Maier & colleagues (unpublished), in which the authors empirically induced this "mimetic crisis" in adults, and found that compared to controls, subjects in the experimental condition systematically demonstrated greater levels of subsequent aggressive attitudes and behaviors. Our study aimed to replicate and extend findings to the student population. Methods & Results. N=150 students attending university in Munich volunteered to participate in the study, and were randomly allocated to the control or test conditions. All subjects also completed an online survey, including the Trait and State Aggression Questionnaires (Buss & Perry, 1992), and the Picture Frustration Test (Rosenzweig, 1948). Multiple regression analyses supported the predicted model, corroborating previous findings. Our work speaks to the motivation literature, invoking frustration and aggression as potentially important constructs for understanding the mimetic crisis in students.

Does the frequency of the background color influence the aesthetic judgment of object pictures?

Jenny Kloster, Stefan Blaschke & Bettina Rolke
University of Konstanz, Department of Psychology
jenny.kloster@uni-konstanz.de

Previous research suggests that arousal influences our aesthetic judgment of objects. We investigated whether the allocation of attention towards an object also affects the aesthetic judgment. To this end, we presented black pieces of furniture (chairs and tables) on either blue or green background and manipulated the frequency of the background color. In the first phase of the experiment, participants were asked for a speeded discrimination concerning the furniture type. In the second phase, these familiar pieces of furniture were intermixed with new ones and all occurred on white background. Participants rated their aesthetic impression and their familiarity with the objects. Because the infrequent background color should capture attention, we hypothesized that objects presented on this color should be processed faster and memorized better than those presented on the frequent background color. Even though there was no advantage for objects presented on infrequent background color in RT and familiarity ratings, they were judged as more aesthetic than those presented on frequent color. We assume that the infrequent background color was implicitly associated with the objects and that this information became relevant when judging the aesthetic value of object pictures. Summarized, our results show that attention influences our aesthetic evaluation.

Visual processing capacity in multiple sclerosis: experimental induction of cognitive fatigue based on a 'theory of visual attention' (TVA)

Steffen Kluckow[1], Philipp M Berg[2], Matthias Schwab[1], Otto Witte[1] & Peter Bublak[1]
[1]Jena University Hospital; [2]Philipps University Marburg
steffen.kluckow@med.uni-jena.de

Multiple Sclerosis (MS) is a chronic demyelinating disease of the central nervous system. Up to 75% of all MS patients suffer from cognitive impairments and describe fatigue ("subjective lack of physical/mental energy") as their most burdening restriction. A recent study (Kluckow et al., 2016) showed that both aspects can be grasped by parametric estimates based on a 'theory of visual attention' (TVA; Bundesen, 1990). Due to its diffuse definitions and mainly subjective measures, however, objective fatigue assessment is still challenging. The current study investigated the causality between the TVA-Parameter processing speed and objective fatigue. 10 MS patients and 10 matched controls were tested in a whole report task before and after inducing fatigue with a vigilance task. In addition, fatigue and sleepiness questionnaires were conducted along with the test procedures. Both MS and control subjects reported increased subjective sleepiness after fatigue induction. However, TVA-based whole report revealed decrements of parameter C, the visual processing rate, after fatigue induction only in MS patients. These results corroborate that this parameter C represents a valid index of objective fatigue in MS patients. Furthermore, the visual processing rate may display a sensitive indicator for the disease severity of this neurodegenerative pathology.

Temporal Movement Primitive Perception under Naturalistic Conditions

Benjamin Knopp, Moritz Schubert & Dominik Endres
University of Marburg, Department of Psychology
knoppbe@staff.uni-marburg.de

Background: Movement Primitives (MP) are hypothetical elements out of which complex movements can be composed. This concept is popular in motor control, but we are interested in MPs as perceptual categories: inspired by the common-coding theory, we investigated if MPs are also a useful approach for describing human movement perception in naturalistic settings. Besides understanding movement perception, finding perceptual MP categories could also be useful for computer-vision/graphics and modelling. Data: We recorded an actor performing natural tasks in a fairly unconstrained manner. The actions consist of walking through an indoor environment, stair climbing, making/drinking coffee. The data was used for a psychophysical movement segment perception experiment and for learning MP models. We showed 70 video clips containing a selection of recordings to 12 participants. They were instructed to segment these clips into non-overlapping time intervals according to perceived boundaries. Results: We then used the segmentations of each participant for the extraction of MPs. Using the Bayesian Information Criterion, we estimated that 6-15 MPs are optimal for a given participant. Furthermore, we did a cluster analysis to compare global and local representations. The results indicate that task-independent MPs provide a better representation of human movement than task-dependent ones.

Spatial compatibility effects in whole-body movements: expertise and movement specificity?

Dirk Koester, Christoph Schütz & Thomas Schack
Bielefeld University/CITEC
dkoester@cit-ec.uni-bielefeld.de

Rapid and proper responses are of particular importance in many sporty situations, e.g., regarding shots on goal in handball. Here, we tested how basic action control principles (spatial stimulus response compatibilities), typically examined by means of simple reactions (e.g., button press responses); can be generalized to ecologically valid situations. Nineteen participants (novices; 24,6 years; 12 female) conducted a spatial compatibility task in which they had to react as a (pretended) handball goalkeeper to a throw of an attacker with a whole-body defense movement while their body movement was recorded. Also simple reactions (button press) were recorded in a further block. Preliminary analyses show a compatibility effect for simple ($t18=9,0$; $p<.0001$) and for complex reactions (button for defence goal; $t18=4,7$; $p<.001$). A compatibility effect during the movement was found in the movement onset ($t18=2,74$; $p<.05$) and the amplitude ($t18=2,97$; $p<.01$). The compatibility effect can be shown in different but not all parameters of (whole-body) movements. In a further experiment with shots on goals (football) we examined the specificity of the effects for the movement technique vs.the influence of a motor expertise. These data suggest that the action control principle can be generalized to ecologically valid situations. This offers new research perspectives through continuous measures of behaviour instead of summed up parameters such as reaction times.

The Influence of Plausibility Variation on Moral Dilemma Judgments

Anita Körner & Roland Deutsch
Universität Würzburg, Lehrstuhl für Psychologie II
anita.koerner@uni-wuerzburg.de

In moral dilemma judgements, participants are presented with information about a hypothetical situation and are then asked to decide between two options. They have to decide whether or not it is appropriate to sacrifice a human life in order to maximize aggregate welfare. However, the judgment requires that participants accept the closed world assumptions for the dilemma—specifically, the statements that (1) both options definitely yield the stated consequences and (2) there is no other (better) option. However, for some of the dominantly used dilemmas, these assumptions seem implausible to many participants. In the present research, we examined whether variations in plausibility systematically influence moral dilemma judgements. Using reactance theory and expectancy-value theory, we predicted that reduced plausibility would reduce the willingness to endorse sacrificing a human life. In two experiments, we manipulated the plausibility of the stated consequences and the statement that there is no alternative action. As predicted, lower dilemma plausibility reduced sacrificial judgements, even though relevant information about the dilemma (e.g., number of people involved and nature of the sacrificial action) was constant. These results indicate that the predominantly used moral dilemmas contain unsuspected sources of variance that can systematically distort moral dilemma judgments.

Matching virtual workplaces with cognitive styles: Exposing users with different cognitive styles to data models of alternative complexity

Ivana Kovacevic[1] & Dusan Vujosevic[2]
[1]Belgrade University, Faculty of Organizational Sciences, Department of Human Resource Management (and Social Sciences); [2]Union University, Faculty of computer science
kivana@fon.bg.ac.rs

While some previous studies did offer the proofs for a superior usability of computer interfaces which were coherent with a business user's cognitive style, some other did not. Participants in our experiment were asked to perform 12 tasks, six in one and six in the another virtual workplace. These virtual workplaces were based on the two dominant approaches to data modelling from the business databases practice. Users' cognitive styles were determined using the Royce`s conception of epistemic profiles and his scales of rationalism, empiricism and metaphorism. Obtained results show that the order of exposition of the two virtual workplaces do matter for the metaphorical style, where the rate of accurate answers drops for the less complex workplace when it is the second in experiment, probably due to some kind of fatigue. For the empiricism, the solving time increases for the complex workplace when it is the first exposed, which could be seen as a confirmation for the assumption that this cognitive style is dependent on the effect of training. The prevalence of rationalism in a user improves his efficiency in the more complex workplace, when second exposed, possibly due to already accumulated problem-solving skills.

Stick to your goals! The influence of current action goals on affective responses increases after stress

Julia Kozlik[1], Roland Neumann[2], Franziska Plessow[3] & Rico Fischer[1]
[1]University of Greifswald, Psychological Institute; [2]University of Trier, Psychological Institute; [3]Harvard Medical School, Neuroendocrine Unit
julia.kozlik@uni-greifswald.de

Acute stress seems to increase goal shielding resulting in enhanced perseveration. Here we investigated whether this would also apply to affective processing contexts which are thought to trigger relatively stable natural response tendencies. Do individuals in stressful situations even stick to current action goals when these counteract their naturally activated responses? To test this participants were either exposed to a stress- or no-stress-induction phase. Afterwards, we applied an affective Simon task that required to categorize a non-valent feature of affective pictures by voluntary facial muscle contractions (zygomaticus vs. corrugator). To manipulate action goals, we randomly intermixed a second task (i.e., valence categorization) for which participants either received a congruent (positive – zygomaticus; negative – corrugator) or incongruent stimulus-response mapping (negative – zygomaticus; positive – corrugator). We observed significant reductions of the affective Simon effect for participants that pursued incongruent (compared to congruent) action goals. Importantly, this effect was stronger in the stressed group. These results indicate that stressed participants rigorously stick to current action goals even though these are in opposition to their natural response tendencies. Importantly, these findings are in line with our hypothesis of increased goal shielding and challenge the widely believed idea that stress promotes habitual behavior.

Cortical underpinnings of geometrical gaze following – an fMRI study

Peter Maximilian Kraemer[1], Goerner Marius[2], Hamidreza Ramezanpour[2], Peter Dicke[2] & Peter Thier[2]
[1]University of Basel, Department for Decision Neuroscience; [2]Hertie Institute for Clinical Brain Research, Department for Cognitive Neurology
peter.kraemer@unibas.ch

Following the eye gaze of others is a key step towards establishing joint attention, allowing two individuals to attend to the same object. Despite gaze following being a bottom up process to a large extent, there is also evidence suggesting a role of contextual and top down knowledge. This becomes relevant when eye vergence information is not sufficient for singling out one target object, the other individual is looking at. While the assessment of eye gaze direction has been attributed to a region in the posterior superior temporal sulcus (pSTS), it remains unclear, where relevant top down information is processed. In an fMRI experiment, subjects decided among several objects, at which a stimulus face was most likely looking at. The objects were spatially arranged on the same axis so that merely relying on gaze direction would lead to ambiguous conclusions. Additional contextual cues either helped to disambiguate the configuration, (facilitating the selection of the target) or compromised it. We found regions in the inferior frontal lobe (IFL) and the posterior parietal cortex (PPC) which were modulated by the level of ambiguity. A time course analysis revealed that the IFG preceded PPC activity, starting early enough to mediate target selection.

Effects of action on cortical BOLD responses in multisensory, simulated self-motion

Milosz Krala[1], Bianca van Kemenade[2] & Frank Bremmer[1]
[1]Dept. Neurophysics and Marburg Center for Mind, Brain and Behavior - MCMBB, University of Marburg;
[2]Translational Neuroimaging Marburg and Marburg Center for Mind, Brain and Behavior - MCMBB, University of Marburg
milosz.krala@physik.uni-marburg.de

Navigation through an environment is both inherently multisensory and mediated by one's own action. In a fMRI paradigm we aimed to identify the neural substrate underlying the multisensory processing of self-controlled self-motion. Visual stimuli simulated straight-ahead self-motion across a ground plane. Auditory stimuli were pure sinusoidal tones, whose frequency scaled with simulated speed of self-motion. The subjects' task was to reproduce (active condition) a previously seen self-displacement (passive condition). Subjects had full control over travel speed, using an MRI-compatible gamepad. We recorded the trajectories of self-motion during the active condition and played it back to subjects in another set of trials (replay condition). We presented a combination of unimodal visual, auditory and bimodal stimuli. Comparing active and replay condition, i.e. the two conditions with identical sensory stimulation, we found enhanced BOLD responses in respective primary sensory cortices during purely visual, auditory and bimodal stimulation. Bilaterally, the angular gyri showed suppressed BOLD responses which correlated negatively with the subjects' error in distance reproduction. We propose that continuous monitoring of action consequences increases BOLD responses in primary sensory areas. Furthermore, our results are in line with the idea of the angular gyrus as comparator for action-related predictions and sensory outcomes.

Infants' gaze patterns for same-race and other-race faces, and the other-race effect

Anna Krasotkina & Gudrun Schwarzer
Justus-Liebig-Universität Gießen, Department of Developmental Psychology
anna.krasotkina@psychol.uni-giessen.de

The other-race effect (ORE) is characterized by poor discrimination of faces from ethnicities other than one's own ethnicity. Previous research has shown that the ORE emerges at approximately 9 months. The exact origin of the ORE, however, is still under discussion. One possible explanation is that infants adopt a specialized gaze strategy for recognizing own-race faces, which may be suboptimal for other-race faces. The goal of our study was to test whether the ORE is linked to different gaze-patterns used by infants during habituation to same- and other-race faces. We habituated 60 Caucasian 9-month-old infants to a Caucasian or Asian female face and preference-tested them with a novel Caucasian or Asian face, respectively. We found that infants looked significantly longer at the novel Caucasian face but not at the novel Asian face, indicating the ORE. While habituating to Caucasian faces, infants maintained high fixation proportions towards the eyes, and significantly increased fixation on the mouth. Conversely, while habituating to Asian faces, they significantly decreased fixation proportion towards the eyes and increased fixation towards the external face features. Thus, our results suggest that the ORE is connected with different gaze strategies used by infants for recognizing same- and other-race faces.

Do robots dream of electric stereotypes? - Effects of gender-specific work stereotypes on trust in humanoid service robots

Johannes Maria Kraus
Ulm University, Department Human Factors
johannes.kraus@uni-ulm.de

Robots are becoming a part of everyday life. This makes it necessary to equip them with understandable and trustable interaction concepts. A common strategy is the employment of anthropomorphic features to provoke more human-like interaction. In the presented study, explicit (name and voice) and implicit gender (personality) of a service robot was manipulated. 40 participants answered questions in both a stereotypical male and female work domain (taxi ordering vs. babysitting). After every question they received feedback by a NAO robot. The interaction was evaluated two times during the task. Implicit gender (personality) had a significant effect on trust and likeability in the male task. The male personality robot was trusted more and perceived as more reliable and competent, while the female one was rated as more likeable. In the female task, no significant effects of gender stereotypes were found. Furthermore, no significant gender stereotypes were found for the explicit gender. These findings indicate that gender stereotypes generalize to human-robot interaction and that they are of relevance for work context.

Mental rotation in basketball: Presenting playing patterns in different orientations of the tactic board affects players' observation time and execution performance under temporal constraints

Daniel Krause, Matthias Rahlenbeck & Matthias Weigelt
University of Paderborn, Psychology and Movement Science
daniel.krause@upb.de

In basketball, tactical instructions are presented on tactic boards under temporal constraints (e.g., 20 second time outs). Therefore, these instructions should be presented in a way that enables fast and errorless visual-spatial information processing. For 32 participants (all novices, 16 female), we scrutinized the effects of different tactic board orientations (i.e. five different spatial disparities relative to the players' on-court perspective) on observation time and on-court performance (i.e. playing pattern execution) under different temporal constraints (self-paced vs. time-pressure). While the Self-paced Group (SpG; n=16) determined the observation time in a self-controlled manner, the Time-pressure Group (TpG; n=16) was given only seven seconds of observation time for each playing pattern. The results for the SpG showed that the self-chosen observation time during instruction was significantly longer and the playing pattern execution accuracy on court decreased for larger spatial disparities between tactic board orientation and players' on-court perspective. Regarding the spatial disparity effect on on-court performance, the TpG did not differ significantly, but was overall less accurate than the SpG during playing pattern execution. These results can be explained by higher cognitive costs that arise during the mental rotation of visual-spatial information from the tactic board into the players' on-court perspective.

Parameter collision in probabilistic models of cognition: How to separate parameterization of evidence strength and choice noise

Antonia Krefeld-Schwalb[1], Thorsten Pachur[2] & Benjamin Scheibehenne[1]
[1]University of Geneva, Geneva School of Economics and Management; [2]Max Planck Institute for Human Development
antonia.Krefeld-Schwalb@unige.ch

In the cognitive sciences, the use of computational models to disentangle psychological factors underlying behavior is wide-spread. In these models, it is often assumed that behavior results from a probabilistic selection among alternatives (e.g., memory traces, risky options, categories). The evidence strength for each of these alternatives is governed by one or more parameters; in addition, there is often a parameter governing how deterministically a choice follows from the relative evidence strength of the alternatives. Conceptually, the characteristics of these processes (i.e., how evidence strength is computed and how noisy the selection process is) are independent. As we highlight, however, due to formal characteristics of the models the parameters representing these characteristics are usually highly correlated, complicating their independent interpretability. We demonstrate this problem for several influential cognitive models, such as cumulative prospect theory for risky choice, the generalized context model for categorization, the SIMPLE model for memory, and the expectancy valence model for decisions from experience. We explore the implications of these parameter intercorrelations and suggest approaches to reduce them. For instance, we show that changing the functional form of the value functions substantially decreases the parameter intercorrelations.

What's past is past: Neither perceptual or semantic preactivation nor prior motivational relevance decrease subsequent inattentional blindness

Carina Kreitz[1], Robert Schnürch[2], Philip Furley[1], Henning Gibbons[2] & Daniel Memmert[1]
[1]Deutsche Sporthochschule Köln, Institut für Trainingswissenschaft und Sportinformatik; [2]Universität Bonn, Institut für Psychologie
c.kreitz@dshs-koeln.de

We are susceptible to failures of awareness if a stimulus occurs unexpectedly and our attention is focused elsewhere. Such inattentional blindness is highly ecologically valid and modulated by various parameters, including stimulus attributes and the observer's attentional set regarding the primary task. In four behavioral experiments (N = 640) we investigated whether previous events and experiences determine whether or not inattentional blindness occurs. Using a simple two-phase paradigm, we found that the likelihood of missing an unexpected object due to inattention did not change when its defining characteristic (its color) was perceptually preactivated. Likewise, noticing rates were not significantly increased if the object's color was semantically preactivated: Neither explicitly mentioning the color several times prior to the occurrence of the unexpected stimulus nor priming the color more implicitly via color-related concepts could significantly reduce the susceptibility to inattentional blindness. The interpretation that these findings reflect the rather general principle that preactivations that are not motivationally relevant for one's current selection goals do not suffice to make an unexpected object overcome the threshold of awareness was overthrown by a fourth experiment: Noticing rates were not significantly increased if the object's color was previously motivationally relevant during an unrelated detection task.

Regulatory focus and propositional processing: Prevention focus bolsters negation processing

Anand Krishna[1] & Fritz Strack[2]
[1]University of Würzburg, Department for Emotional and Motivational Psychology; [2]University of Würzburg, Department for Social Psychology
krishna@psychologie.uni-wuerzburg.de

Regulatory focus (Higgins, 1997) has been shown to affect many aspects of motivation and cognition. Prevention focus in particular increases the likelihood of effortful processing (e.g. Pham & Avnet, 2004). From the perspective of several dual-process theories (e.g. Strack & Deutsch, 2004), propositional processing is more effortful than associative processing. Therefore, prevention focus may increase the effect of propositional processes on judgements. Negation, i.e. the transformation of a concept into its logical opposite, is a propositional operation that a prevention focus might augment particularly strongly due to its connection to avoidance and eliminating possibilities (e.g. Mourali & Pons, 2008). Four experiments (total N = 415) provide evidence that a chronic prevention focus increases negation effects in an AMP (cf. Deutsch et al., 2009), especially when augmented by a situational prevention focus. The effect is shown to be robust over two stimulus sets and two manipulations of regulatory focus. In addition, preliminary evidence is presented that the effect may reflect increased correspondence between implicit and explicit attitudes as measured by the AMP. These studies provide the first empirical evidence for improved negation processing in a prevention focus, which may in turn explain many phenomena found in prior studies.

On putting 'cap to pen' or 'pen to cap': A cross-linguistic comparison of motion expressions, and gaze and memory behaviors in German and Korean speakers

Alexandra Kroiss
University of Vienna, Department of Linguistics
alexandra.kroiss@univie.ac.at

This study investigates the typological and grammatical influence of language (German and Korean) on linguistic expressions, visual perception (measured by eye movements), and recognition of caused spatial events. In German, a satellite-framed language, Path of motion is lexicalized in satellites, whereas in Korean, a verb-framed language, Path is typically lexicalized in the verb root. We tested German and Korean native speakers in a linguistic description task as well as in a memory task involving eye tracking. Our results show that both verbal (linguistic expressions) and nonverbal (memory performance, eye movements) behaviors are determined at least in part by language-specific grammar. While Korean speakers principally categorize spatial relationships according to degree of fitness, German speakers do so based on containment or support. Language-specific effects are also found in the looking behavior: While Korean speakers spend equal amounts of time looking at the Figure and the Ground, German speakers pay more attention to the Figure object. Regarding memory performance, Korean speakers' error rate in identifying which object moved is higher compared to German speakers. Our findings show that conceptual representation of Figure and Ground, fundamental elements of motion events, are significantly influenced by the grammatical structures of the speakers' native language.

The influence of mood on memory for happy and sad faces

Meike Kroneisen
University of Koblenz-Landau
kroneisen@uni-landau.de

Facial identification is important because it informs us regarding how to react to an approaching person, who might be friend or foe. In social situations, the emotional expressions of faces are important and very salient aspects of nonverbal communication. Previous work has shown that the facial expression (happy or angry) influences the memory of this face in a later recognition test. It is possible that positive expressions facilitate facial processing, therefore, more cognitive resources are available to process facial identity. Research on mood dependent memory shows that the likelihood of recalling something is higher when encoding and retrieval moods match than when they mismatch. We wanted to examine whether memory for positive and negative faces is influenced by the emotional state of the participant. Therefore, we presented our participants facial photographs with different expressions (happy vs. sad). Half of our participants saw a sad video clip before the presentation of the photographs. A later recognition test indicated that old-new discrimination but not source memory is affected by whether a face was presented with a happy or a sad expression. However, a different pattern reveals when the emotion-al state of the participant was manipulated.

The Theory of Visual Attention: A model of endogenous and exogenous influences in prior entry

Alexander Krüger & Ingrid Scharlau
Paderborn University
alexander.krueger@uni-paderborn.de

Visual prior-entry describes the phenomenon that an attended stimulus is perceived earlier than an unattended stimulus. Exogenous and endogenous attentional manipulations affect prior entry. This phenomenon becomes evident in the temporal-order judgment (TOJ) paradigm. The TOJ has recently been modeled in terms of Bundesen's Theory of Visual Attention (TVA) that conceptualizes visual perception as biased competition. This competition is mathematically modeled as a race for representation. Thus, TVA explains visual prior-entry in TOJ as a special case of this mathematical race model. Whereas endogenous attentional biases have always been a part of TVA a parameter for exogenous attentional influences has only recently been added. So, it should be possible to distinguish, quantify and compare endogenous and exogenous attentional manipulations in prior entry with a TVA-based model. Particularly, TVA predicts an interaction between both parameters. In this talk, we present a modeling and empirical approach that provides a quantitative estimation of endogenous and exogenous attentional components and their interaction in TOJs. Thereby, checking TVA's predictions.

A response-selection training helps 2.5-year-olds to solve intuitive physics tasks

Markus Krüger, Friederike Kracht & Horst Krist
Ernst-Moritz-Arndt-Universität Greifswald
markuskr@uni-greifswald.de

In certain cognitive tasks, infants apparently outperform toddlers and even kindergartners. A possible explanation for this phenomenon might be the way competencies are assessed. While infants are usually tested with Violation-of-Expectation paradigms, older children are presented with verbal or action tasks. When asked to appraise the physical support of objects, for example, 2-year-olds fail completely in an action task (Krist, Krüger, & Buttelmann, 2017). However, when 2-year-olds are tested with eye-tracking measures, they partially consider support adequately (Krist, Atlas, Fischer, & Wiese, in press). One factor that probably affects performance in this context is the extrinsic cognitive load imposed by task demands (Keen, 2003). One such task demand is assumed to be the requirement to select a response. To examine the potential impact of this factor, we tested whether a response-selection training would improve 2.5-year-olds' performance in a physical support task. One group of children was trained to answer questions about animals in the same format they were later asked about physical support. A control group received no training. Performance in the support task was above chance level for the training group only. Therefore, further testing the possible influence of task demands on intuitive physics tasks is justified.

The effect of Working-Memory demands on task-order coordination in DT situations

Sebastian Kübler[1], Tilo Strobach[2] & Torsten Schubert[3]
[1]Martin-Luther Universität Halle-Wittenberg, Institut für Psychologie; Humboldt-Universität zu Berlin, Institut für Psychologie; [2]MSH Medical School Hamburg, Fakultät für Humanwissenschaften; [3]Martin-Luther Universität Halle-Wittenberg, Institut für Psychologie
kueblese@hu-berlin.de

Dual-task (DT) situations are characterized by the requirement for additional task-order coordination processes that regulate the processing order of two temporally overlapping tasks. These TOC processes can be investigated when participants perform DT blocks with a variable order of both tasks. Performance is usually improved on trials in which both tasks are processed in the same order relative to the preceding trial (same-order trial) compared to trials in which the processing order of both tasks differs relative to the previous trial (different-order trial). In two experiments, we tested the hypothesis that this performance benefit for same-order trials results from task-order priming based on an order trace of the previous trial stored in Working Memory (WM). Participants performed a DT in random-order DT blocks while demands on WM were manipulated by increasing the number of stimulus-response bindings (Experiment 1) or implementing an additional updating task into the experimental paradigm (Experiment 2). We found that the performance benefit for same-order trials was reduced when demands on WM were increased. This result is in line with the assumption that the order of two tasks in DT situations can be prepared based on order-information from the previous trial which is stored in WM.

Lexical access on behalf of task partner: electrophysiological insights from Joint Picture Naming

Anna Katharina Kuhlen & Rasha Abdel Rahman
Neurokognitive Psychologie, Institut für Psychologie, Humboldt Universität zu Berlin
anna.kuhlen@hu-berlin.de

When naming a sequence of pictures, naming latencies increase with each new picture of a given semantic category, so-called cumulative semantic interference. We have demonstrated that naming latencies not only increase in response to speakers' own prior naming of pictures, but also in response to their task partner naming pictures (Kuhlen & Abdel Rahman, 2017). Here we investigate the electrophysiological underpinnings of this effect. EEG was recorded from 30 participants who believed to be naming pictures together with a remote task partner. We observed an increased posterior positivity around 250-400ms, which corresponds to an increase in naming latencies and has been taken to reflect lexical selection. Unlike our previous studies, only a subset of subjects showed partner-elicited interference. Crucially, this group of subjects showed a stronger increase in posterior positivity when semantic categories were co-named with the partner (vs. named alone), and only these subjects showed a similar posterior positivity when the partner named a picture (vs. when nobody named it). This suggests that these subjects simulated lexical access on behalf of their partner. In conclusion, our study connects partner-elicited cumulative semantic interference to electrophysiological underpinnings, yielding promising insights into the processes of language production in social settings.

Age-Related Differences in Metacognitive Monitoring and Control When Preparing for Recall

Beatrice G. Kuhlmann
University of Mannheim
kuhlmann@psychologie.uni-mannheim.de

Age-related memory differences are more pronounced on recall than on recognition tests. Two experiments examined whether older adults are aware of recall's particular difficulty (metacognitive monitoring) and adapt strategies accordingly (metacognitive control). Young (18-30 years) and older (60-87 years) participants either expected a recognition or a recall test while encoding word lists. Whereas young adults had adequate test-difficulty monitoring already after reading format descriptions, older adults needed practice with the format. Recall-expecting young adults consistently (on both test formats) outperformed their recognition-expecting peers. Recall patterns indicated that recall-expecting young adults engaged more inter-item relational processing, both of adjacent unrelated study items (E1) and of distant semantically-related items (E2). For older adults, recall-expectancy effects were mixed: There was consistently no effect on recognition but improved recall of unrelated (E1) but not of semantically-related (E2) words. Recall patterns suggested that recall-expecting older adults did not engage more relational processing of adjacent items in E1 but unsuccessfully tried to use semantic clustering in E2. Thus, there are qualitative differences in how young and older adults prepare for recall and whether older adults can successfully prepare for recall depends on the study material.

The limits of implicit sequence learning

Anja Kühnel
Medical School Berlin, Allgemeine Psychologie
anja.kuehnel@medicalschool-berlin.de

The study aims to search for the limits of implicit sequence learning. If subjects are confronted with a serial reaction time paradigm in which stimulus processing does neither require the spatial attention nor the motor learning system, implicit learning should not take place. This was reseached with a serial reaction time task in which participants were asked to read aloud colour words. The words were arranged in a second order conditional sequence and interrupted by a second sequence presented just once per block. The results show that implicit sequence learning is not detectable in the reaction times or error rates. To control for an inability to detect implicit sequence learning through these measures a transfer condition was introduced in which participants had to name colour patches following the same sequence. This condition at least hints at the possibility to learn implicitly. The described experiment was able to show that the spatial attention and motor learning system seem to be crucial for at least the detection of implicit sequence learning although they might not be entirely necessary to learn implicitly.

Dissociating Intentional and Unintentional Learning Effects in Evaluative Conditioning

Niels Kukken & Mandy Hütter
Eberhard Karls Universität Tübingen
niels.kukken@uni-tuebingen.de

Evaluative conditioning describes the change in liking for an initially neutral stimulus (CS) after being paired with an already valent stimulus (unconditioned stimulus; US). In everyday life however, we rarely encounter US-CS pairings in isolation. Rather, the pairing is often accompanied by a functional predicate that describes how the US and CS are related. For example, police officers often co-occur with breaking the law (association), but only because they stop people from breaking it (implication). Using a process-dissociation approach, we investigated how memory for the association and the implication of the CS predict the change in liking of a CS: Participants were instructed to learn US-CS pairings (positive or negative) together with a functional predicate (stop or start; Moran & Bar-Anan, 2013). In a subsequent memory task, participants were instructed to report the implication of the CS (for example, CSs that stop a negative sound have a positive implication). We show that when participants do not intentionally report the implication of the stimulus, they unintentionally respond in line with the US-CS coupling. Furthermore, we demonstrate that both intentional and unintentional responses uniquely predict the change in liking of a CS. Theoretical and practical implications will be discussed.

Disarming the Gunslinger effect: Reaction beats intention for cooperative actions

Wilfried Kunde, Lisa Weller & Roland Pfister
University of Wuerzburg
wilfried.kunde@uni-wuerzburg.de

According to famous physicist Niels Bohr, gunfights at high noon in Western movies do not only captivate the cinema audience, but they also provide an accurate illustration of a psychophysical law. He suggested that willed actions come with slower movement execution than reactions and therefore, a film's hero is able to get the upper hand even though the villain normally draws first. A corresponding "Gunslinger effect" has been substantiated by empirical studies. Because these studies used a markedly competitive setting, however, it is currently unclear whether the Gunslinger effect indeed reflects structural differences between willed actions and reactive movements, or whether it is a by-product of the competitive setting. To obtain bullet-proof evidence for a true reactive advantage, we investigated willed and reactive movements during a cooperative interaction of two participants. A pronounced reactive advantage emerged, indicating that indeed two independent systems control willed and reactive movements.

The role of the cerebellum in motor-cognitive dual-tasking

Erika C. S. Künstler, Kathrin Finke, Albrecht Günther, Carsten Klingner & Peter Bublak
Hans Berger Department of Neurology, Jena University Hospital
Erika.Kuenstler@med.uni-jena.de

Dual-tasking is central to everyday life. Yet this concurrent performance of two tasks typically leads to decreased accuracy in the performance of either one or both tasks. Whilst cerebellar involvement in motor planning and action control has long been established, recent imaging data from healthy subjects suggests that this brain area also plays a role in executive functions, and in motor-cognitive dual-tasking in particular. This talk will look more closely at the implications of this, presenting findings from a motor-cognitive dual-tasking study conducted on stroke patients with hemispherically isolated cerebellar lesions, as compared to healthy age-matched controls. More specifically, a visual attention whole report test based on the "theory of visual attention" (TVA) was combined with an alternating finger tapping task. This motor-cognitive dual-task indicated that motor performance deteriorates when a visual task is conducted concurrently, with declines in visual attention occurring not only as a result of performing two tasks simultaneously, but also being further exacerbated by cerebellar damage. Moreover, a reduction in visual processing speed (parameter C) was seen in those patients who displayed an especially pronounced deficit in tapping. This was supported by imaging data, which showed decreased functional connectivity associated with higher dual-task cost.

Perception of penalty takers in soccer with varying graphical levels of detail

Johannes Kurz[1], Fabian Helm[2], Nikolaus F. Troje[3] & Jörn Munzert[1]
[1]Justus-Liebig-University, Department of Sport Science; [2]Goethe University, Department of Sport Science; [3]Queen's University, Department of Psychology
johannes.kurz@sport.uni-giessen.de

The aim of this study was to investigate whether the presentation of penalty takers in soccer with different graphical levels of detail affect the prediction accuracy, the response time and the gaze behavior of goalkeepers. 13 male soccer players (experience: 14.8 ± 4.4 years; age: 21.0 ± 2.7 years) were recorded while they had to predict shot direction (left/right) of penalty takers with varying graphical levels of detail. Penalty takers were presented either as point-light-displays, stick-figure-displays or as realistic avatars (Loper, Mahmood, & Black, 2014) on a large screen (3.2 x 2.1 m) in life-size. The participants had to perform close to realistic movements to the appropriate side. Gaze behavior was recorded with a head-mounted eye tracker (SMI, Teltow, Germany). Results showed that the percentage of correct predictions was significantly higher for realistic avatars (71.7%) and for stick-figure-displays (69.6%) compared to point-light-displays (63.3%). However, stick-figure-displays and realistic avatars did not differ significantly. The response time did not reveal significant differences between conditions. Gaze behavior in terms of the viewing time on the areas of interest (head, upper body, hip, legs) differed between realistic avatars compared to point-light-displays and stick-figure-displays, but no significant difference was found between point-light-displays and stick-figure-displays.

Near-hand effect revisited: Potential of Virtual Reality (VR) to study psychological processes

Martin Lachmair, Christian Scharinger & Peter Gerjets
Leibniz-Institut für Wissensmedien Tübingen
m.lachmair@iwm-tuebingen.de

According to the near-hand effect cognitive control is enhanced for stimuli presented nearby subjects' hands. For example, Weidler and Abrams (2013) observed the flanker interference effect to be reduced in task conditions with subjects' hands positioned nearby the stimuli as compared to positioning the hands further away. Building on these observations in the current study (N = 18) we were interested whether the near-hand effect would also occur when flanker stimuli were presented in VR with virtual controllers replacing subjects' hands. The controllers were either positioned on both sides nearby the Flanker stimuli (near-hand condition) or were not visible (far-hand condition). In line with Weidler and Abrams (2013) we did not observe any effect of posture on reaction times (RTs). RTs however showed the classical flanker interference effect with longer RTs for incongruent as compared to congruent flanker stimuli. For accuracy we also found the flanker interference effect with lower accuracies for incongruent as compared to congruent flanker stimuli. In addition, we observed a main effect of posture on accuracy with accuracies being higher in the near- as compared to the far-hand condition. However, we did not observe an interaction between posture and congruency as in the original study.

Looming sounds benefit emergency braking due to their saliency

Marie Lahmer[1], Lewis Chuang[2] & Verena Carola Seibold[3]
[1]Max-Planck-Institut Biologische Kybernetik; [2]Max Planck Institute for Biological Cybernetics; [3]Eberhard Karls University Tübingen, Department of Psychology
marielahmer@humanmachinesystems.org

Braking responses are faster when drivers hear looming sounds that increase in intensity, relative to sounds with constant intensity (Gray, 2011). This finding agrees with research that has shown preferential neural processing for looming stimuli (e.g., Tyll et al., 2013). It remains unknown if the looming benefit reported by Gray (2011) was due to the perceived saliency of looming sounds, or as a result of their ability to re-direct attention away from vehicle control to braking. The current study was conducted in a driving simulation for a vehicle with automated lateral and longitudinal control. Participants were only required to perform emergency braking if the lead vehicle suddenly braked. We found fastest braking times when these instances were accompanied by a looming sound (M=825 ms), relative to a constant sound (M=844 ms), or no sound (M=1098 ms; F(1.29, 23.3)=200, p<.05, ?2=0.9). There was no significant difference in false brakings induced by looming and constant sounds (t(18)=.57, p=.58). Thus, we find that looming sounds facilitate braking without increasing a bias for braking. This work demonstrates that looming sounds can hasten braking directly, even in the absence of task-switching. We discuss the implications of this work to auditory warning design.

When specific action biases meet nonspecific preparation: Event repetition modulates the variable-foreperiod effect

Robert Langner[1], Michael B. Steinborn[2], Simon B. Eickhoff[1] & Lynn Huestegge[2]
[1]Heinrich Heine University Düsseldorf, Institute of Systems Neuroscience; [2]University of Würzburg, Psychological Methods, Cognition, and Applied Research
robert.langner@uni-duesseldorf.de

Preparing for the moment of action speeds up performance even if the particular action is unknown beforehand. When the preparatory interval, or foreperiod (FP), varies unpredictably between trials, responses usually become faster with increasing FP length. This temporal preparation benefit partly originates from asymmetric sequential effects of preceding FP length, which mostly affect performance in short-FP (vs. long-FP) trials. In two experiments, we examined whether and how event-specific biases arising from previous stimulus processing and responding affect both variable-FP and sequential FP effects. To this end, we evaluated the impact of trial-to-trial repetitions versus shifts of imperative events. Reaction-time benefits of event repetitions were greater in short-FP trials, just like sequential FP effects but independent of them. This interaction pattern was more strongly pronounced in a wide (vs. narrow) temporal context, arguing against a simple decay-based explanation of absent event repetition benefits in long-FP trials. Instead, our data support a view of temporal preparation as a dynamic combination of attaining time-point-related response-unspecific readiness and facilitating the processing of specific stimulus–response events, biased by previous action. Forming a complementary balance, the behavioral impact of the latter mechanism appears to depend on the strength of the former.

Learning a Visuomotor Rotation in a Dual Task Paradigm

Lisa-Marie Langsdorf[1], Frederic Goehringer[2], Raphael Schween[1], Sven-Soeren Schwippert[1], Mathias Hegele[1] & Thomas Schenk[2]
[1]Justus-Liebig-University, Neuromotor Behavior Lab, Department of Psychology and Sport Science; [2]Ludwig-Maximilians-University, Clinical Neuropsychology, Department of Psychology
Lisa.M.Langsdorf@sport.uni-giessen.de

Delaying visual feedback to subjects adapting to a visuomotor cursor rotation has been found to enhance explicit and attenuate implicit learning. Dual task costs occur when a secondary task taps the same resources as the primary task. We here ask if these two phenomena interact and want to explore which aspect of motor learning is most affected by a secondary task. Participants practiced a 30° visuomotor cursor rotation and received terminal visual feedback either when they had reached the target or 500 ms later (delay-condition). Feedback delay and secondary task (none or auditory 1-back) were tested in a 2x2 between-subject-design. Explicit, implicit and total learning were dissociated in a series of single-task posttests. We found that participants receiving delayed feedback showed significantly less implicit and somewhat (but not significantly) more explicit learning. Dual task costs were present during practice but absent in all posttests. We argue that in a motor learning paradigm a secondary task affects performance in the task but not the learning process itself. It seems to indicate limited expression during dual-task practice. Alternatively, participants could be learning explicitly from remembered observations during the single-task posttests.

Three Weeks of SSRI Administration enhances the Visual Perceptual Threshold - A Randomized Placebo-Controlled Study

Jon Lansner
University of Copenhagen, Center for Visual Cognition
Lansnerjon@gmail.com

The serotonergic system has been repeatedly linked to visual attention in general, but the effects of SSRI on specific components of visual attention remain unknown. Changes in distinct perceptual and cognitive processes are not readily evident in most attention paradigms, however in this study, we isolate basic aspects of visual attention to investigate potential effects of longer-term SSRI administration on visual attention in healthy males. In a randomized double-blind placebo-controlled design, 32 young healthy males were tested on multiple attentional parameters, before and after 3 weeks of SSRI intervention with fluoxetine (40 mg daily) or placebo. Data were modelled with a computational theory of visual attention to derive independent estimates of five distinct components of visual attention. The SSRI-intervention selectively and significantly lowered the threshold for conscious visual perception. We demonstrate that this improvement does not stem from a general increase in the speed of visual processing, as previously suggested, but specifically from a change in the perceptual threshold. The study provides a novel description of the attentional dynamics affected by SSRI, while supporting previous findings on attentional effects of SSRI. Furthermore, it accentuates the utility of employing accuracy-based measures of attentional performance when conducting psychopharmacological research.

Prediction in saccadic eye movement

Markus Lappe
University of Muenster, Institute for Psychology
mlappe@uni-muenster.de

Saccades are fast, brief, and frequent eye movements that quickly switch the retinal image from one point of interest to another, produce transient image disturbances, and require open-loop control. Predictive mechanisms are essential for all of these issues. Prediction in saccadic eye movement is based on efference copy signals of the saccade motor commands. These signals are used by the brain to predict the post-saccadic retinal location of objects seen in the pre-saccadic scene, to enhance and speed-up processing in the target region, to adapt saccade motor control, and to reduce the impact of visual disturbances experienced during saccades. In my presentation I will compare several of these predictive mechanisms and discuss their dependence on processes involved in saccade preparation. I will compare reactive saccades, i.e. saccades made quickly to a suddenly appearing target, and voluntary saccades, i.e. saccades made at a slower pace to continuously visible targets. The latter supports better preparation and, in some cases, better prediction.

Time will tell: Binding and retrieval of temporal distractors

Ruth Laub, Birte Moeller & Christian Frings
University of Trier, Department of Cognitive Psychology
ruth.laub@uni-trier.de

If a target stimulus is presented together with a distractor, both stimuli can be encoded together with the response in an event file (see Hommel, 2004). In turn, even the repetition of the distractor can retrieve the encoded response (the distractor-response binding effect). Moreover, research regarding stimulus-response (S-R-) binding effects (Bogon, Thomaschke, and Dreisbach, 2017) found that temporal features of a stimulus can be bound into auditory representations. Here we focused on the role a time interval can play in S-R-binding if it is presented as a distractor. In the present experiment (N = 30), a prime-probe design was chosen to investigate, whether a temporal distractor stimulus (e.g. time interval before stimulus onset), which was presented additional to a visual distractor stimulus, can be integrated with a response and later on retrieve the integrated response. The results show that the temporal distractor stimulus is integrated with the response and the visual distractor stimulus, modulating response retrieval that is triggered by repetition of the visual distractor.

You get what you (unconsciously) see: Der Einfluss von Farbpriming auf Aufmerksamkeit, Verarbeitungszeit und Gedächtnisleistung

Sarah Leinberger & Thomas Bäumer
Hochschule für Technik Stuttgart, Wirtschaftspsychologie
72lesa1mwp@hft-stuttgart.de

Beim Farbpriming werden durch Farbreize bestimmte Assoziationen im Gedächtnis aktiviert, die Einfluss auf folgendes Verhalten haben können. So kann beispielsweise (unbewusstes) Priming von Farbreizen die Auswahl von entsprechend verpackten Schokoladen beeinflussen (Beck, Kolb & Bäumer, 2017). In der vorliegenden Arbeit wurde untersucht, welche kognitiven Prozesse als potentielle vermittelnde Variablen diesen Effekt erklären könnten. Dabei wurden die Prozesse Aufmerksamkeit, Verarbeitungszeit und Gedächtnisleistung betrachtet. Als Hypothese wurde erwartet, dass bei Vorgabe eines Farbreizes als Prime sich die Aufmerksamkeit, Verarbeitungszeit und Gedächtnisleistung selektiv für Zielreize in derselben Farbe erhöhen sollte. In einer Studie wurden 30 Versuchspersonen nacheinander mit keinem (Kontrollbedingung), einem roten und einem blauen Farbreiz als Prime konfrontiert. Danach sollten die Probanden Regale mit bunten Objekten betrachten und sich diese einprägen. Dabei wurde mittels Eye-Tracking die Aufmerksamkeit und Verarbeitungszeit der Farbreize erfasst; die Erinnerungsleistung über eine direkte Abfrage. Die Ergebnisse zeigen einen selektiven Einfluss auf die Aufmerksamkeit und die Verarbeitungszeit für die jeweils als Prime verwendete Farbe. Es zeigt sich also, dass durch Farbpriming Aufmerksamkeit und Informationsverarbeitung von folgenden Reizen beeinflusst werden. Allerdings scheint dieser Effekt zeitlich sehr flüchtig zu sein. In weiteren Studien sollte untersucht werden, ob diese Variablen als Mediatoren den Einfluss von Priming auf eine Auswahlentscheidung erklären können.

Neural correlates of incidental L2 auditory word learning

Kristin Lemhöfer, Julia Egger & James McQueen
Radboud University Donders Institute for Brain, Cognition and Behavior
k.lemhofer@donders.ru.nl

We investigated the electrophysiological correlates of incidental word learning in a second language (L2). Native Dutch speakers alternately made price comparisons of depicted objects in their L2 English, or listened to and judged those by a virtual partner. Critically, some of the object names (e.g., 'whisk') were previously unknown to them, as verified in a pretest. Later trials where participants had to name the same critical objects showed whether they had learned the words. On average, 36 % of the previously unknown words were learned after the first, and another 20 % after the second exposure. Instead of an enlarged N400 usually observed for pseudowords vs. words, there was a late-positive ERP for previously unknown compared to known words, suggesting that new to-be learned words are encoded differently than pseudowords. Furthermore, there was a late positivity for subsequently learned vs. forgotten words, similar to what has been observed by others for explicit learning tasks and other materials than L2 words. Furthermore, learned new words became less distinguishable from previously known words than did not yet learned new words in the second exposure. This study is the first to reveal neural correlates of learning and memory for new L2 words.

Diffusion modeling in motivational psychology: Inter-individual differences in fear of failure predict cognitive processing

Veronika Lerche[1], Andreas B. Neubauer[2] & Andreas Voss[1]
[1]Heidelberg University, Psychological Institute; [2]Department for Education and Human Development, German Institute for International Educational Research (DIPF)
veronika.lerche@psychologie.uni-heidelberg.de

Individuals high in implicit fear of failure (FF) have been found to show reduced performance in achievement settings. However, the underlying mechanisms of this diminished performance have not yet been examined. In an experiment based on 280 participants, we investigated the effects of implicit FF on the cognitive processes involved in a binary decision task. The binary task was introduced to the participants as a measure of intelligence. FF was aroused by means of false performance feedback: One group of participants received mainly negative performance feedback (frustration group) in contrast to predominantly positive feedback in the control group. A diffusion model analysis revealed that individuals higher in FF suffered more from the negative performance feedback in terms of speed of information accumulation (i.e., drift rate of the diffusion model). Participants higher in FF did not differ from their less fearful counterparts in speed-accuracy settings or non-decisional components. By means of our study we exemplarily show that the diffusion model can provide new insights in the field of motivational psychology. The presentation of this study will be preceded by an introduction to diffusion modeling to provide the background knowledge for this talk and also the subsequent talks of this symposium.

Too good to be true? Behavioral and pupillometric signatures of surprise in risk—reward environments

Christina Leuker, Thorsten Pachur, Ralph Hertwig & Timothy J Pleskac
Max Planck Institute for Human Development
leuker@mpib-berlin.mpg.de

Risks and rewards are inversely related in many domains in the environment (Pleskac & Hertwig, 2014). Do people internalize and exploit the link between risks and rewards when probability information is available (decisions under risk)? Using a novel preferential oddball paradigm, we show that people build up expectations about risk-reward structures from the choice environments they experience. Across two experiments (N = 183), participants priced monetary gambles drawn from negative, positive or uncorrelated risk-reward environments. In later trials, participants were presented with surprising gambles that did not match the environments' risk-reward structure. Participants took more time responding to surprising versus expected options. Crucially, surprisingly-good options were evaluated with even more scrutiny than surprisingly-bad options. When time was limited, prices of surprising, high stakes options deviated from the expected values of the gambles towards the expected probability. Moreover, surprisingly-good options were associated with an increased pupil size. Taken together these signatures of surprise show how risky options are evaluated by not only the probabilities and payoffs that make up the option, but by their overall fit within a learned risk-reward environment. Overall, these signatures may reflect an adaptive response to help identify when options are too good to be true.

Cognitive performance under motor demands – On the influence of task difficulty and postural control

Magnus Liebherr[1], Hanna Weiland-Breckle[2], Tanja Grewe[3] & Petra B. Schumacher[2]
[1]University of Duisburg-Essen, Department of General Psychology: Cognition; [2]University of Cologne, Department of German Language and Literature I; [3]Hochschule Fresenius, University of Applied Sciences, Faculty of Health and Social Sciences
magnus.liebherr@uni-due.de

We often walk around when we have to think about something, but suddenly stop when we are confronted with a further demanding cognitive task. The present study aimed to investigate neurophysiological effects of simultaneously performing motor and cognitive tasks as well as the influence of task difficulty. Twenty healthy individuals (24.1 years) performed two cognitive tasks with different levels of difficulty while sitting and standing on one leg. In addition to behavioral data, we recorded the electroencephalogram from 26Ag/AgCI scalp electrodes. Behavioral findings revealed no significant effects for the two factors. Statistical analysis of the early time window (200-300ms) registered a motor x cognition interaction [$F(1,19)=5.83$, $p<0.027$]. Resolution of this interaction revealed an effect of the cognitive task under one-legged stance condition [$F(1,19)=4.32$, $p<0.051$], with a more pronounced positivity for the simple task. No significant differences emerged for the simple motor condition [$F<0.6$]. Analyzing the time-window between 350 and 500ms, no interaction was found between motor and cognitive tasks but main effects of the motor task [$F(1,19)=27.09$, $p<0.001$] and a marginal effect of the cognitive task [$F(1,19)=4.12$, $p<0.057$]. The motor-cognitive interaction found in P2, leads to the suggestion that the more complex motor task facilitates cognitive task performance.

Lack of sleep hampers cognitive control: reduced proactive control after sleep restriction

Simon Liegl, Lucas Haraped, Pierre Sachse & Thomas Maran
University of Innsbruck, General and Experimental Psychology
simon.liegl@student.uibk.ac.at

According to the Yerkes-and-Dodson Law the influence of arousal on performance follows an u-shaped function, meaning performance is the highest when a person is under the influence of an optimal level of arousal. As we could recently proof, an increased arousal does, in fact, impair the performance in tasks requiring a 'cognitive' strategy instead of reflexive responding (Maran et al., 2017). This may be attributable to a greater reliance on a 'habitual' at the cost of a more demanding 'cognitive' processing mode (Schwabe & Wolf, 2013). The current study aimed to examine whether states at the opposite end of the u-shaped function, i.e. states low in arousal cause similar effects. We conducted a full within-subject experiment testing the impact of acute sleep deprivation on proactive control, measured by the performance in the DPX-Paradigm (Jones, Sponheim, & MacDonald, 2010). We tested 10 healthy male adults ($M = 20.5$, $SD = 1.78$) four consecutive times, each one week apart, with one measurement after a controlled period of 24 hours of sleep deprivation. Sensitivity for A-cue trials was used as an indicator of the reliance on proactive control. The results proved strong evidence for a specifically impaired proactive control after sleep restriction.

Optimizing multitasking through our body: Reduced between-task interference when a single response hand is located close to the prioritized stimulus

Roman Liepelt[1] & Rico Fischer[2]
[1]German Sport University Cologne, Performance Psychology; [2]University of Greifswald, Psychology
r.liepelt@dshs-koeln.de

When response hands are located close to a stimulus (hands proximal) this stimulus receives more attentional resources as when the hands are located further away (hands distal). We used a dual-task paradigm in combination with two hand proximity manipulations to test if hand proximity improves task shielding – the separation of two tasks. In Experiment 1, both response hands were either located at the monitor or on the knees. In Experiment 2, additional conditions were included, in which a single hand (left or right response hand) was located in a proximal condition. In Experiment 1, results showed that close stimulus-hand proximity reduced the amount of between-task interference (increased Task 1 shielding). Extending these findings, in Experiment 2 a further reduction of between-task interference was obtained when a single hand was located at the monitor instead of two hands. These results provide further evidence for a hand-specific processing benefit supporting more separate processing of two tasks. Results are inconsistent with the assumption of a generally increased attentional processing benefit for multiple stimuli within hand space. These findings demonstrate that stimulus-hand proximity affects the quality of multiple task performance, which is discussed in the context of basic and applied cognitive research.

Neither singleton detection nor feature search – electrophysiological evidence for an intermediate, dimension-based, search mode

Anna M. Liesefeld[1], Heinrich René Liesefeld[2] & Hermann J. Müller[3]
[1]Department Psychologie, Ludwig-Maximilians-Universität München; [2]Department Psychologie und Graduate School of Systemic Neurosciences, Ludwig-Maximilians-Universität München; [3]Department Psychologie, Ludwig-Maximilians-Universität München; Birkbeck College
anna.liesefeld@psy.lmu.de

When searching through visual scenes for a target object, attention is not randomly shifted around, but guided by task goals as well as object characteristics. Abundant evidence shows that people can either attend to any conspicuity (saliency-detection mode) or, alternatively, restrict search to objects with specific features (feature-search mode). Which search mode people are in can be probed by presenting selected distractors and extracting the N2pc component from the EEG. Using this approach, we recently observed exceptionally strong attentional capture (distractor N2pc) by an orientation-defined distractor during search for an orientation-defined target, a finding explained by the Dimension Weighting Account (DWA): Up-weighting the target-defining dimension (orientation) inevitably also up-weighted the distractor. Thus, DWA implies an intermediate, dimension-based, search mode. To substantiate this claim, we performed a series of EEG experiments showing that, when searching for a 12° tilted target, attention is captured by distractors tilted 45° into the opposite direction, while red distractors are ignored. This holds true even when the two types of distractors occur unpredictably intermixed across trials. We conclude that searching for a specific feature (holding a target template) is not always (or typically) possible and that people then resort to a dimension-based search mode.

How an executive control mechanism gates access to visual working memory

Heinrich René Liesefeld[1] & Hermann J. Müller[2]
[1]Department Psychologie, Ludwig-Maximilians-Universität München; Graduate School of Systemic Neuroscience;
[2]Department Psychologie, Ludwig-Maximilians-Universität München; Birkbeck College
Heinrich.Liesefeld@psy.lmu.de

As the capacity of visual working memory is severely restricted, executive control mechanisms that guard VWM against the intrusion of irrelevant information are pivotal. Previously, we identified a neuronal correlate of such a control mechanism that predicts the amount of unnecessarily stored information as well as the capacity of VWM. This prefrontal bias signal manifests as a negative increase in the electroencephalogram for distractor-present relative to distractor-absent trials over (pre-)frontal electrode sites. We aimed to elucidate the nature of this apparently crucial control mechanism and ask which information it works on. By trial-wise providing partial information about the memory display prior to its onset, we examined whether the prefrontal bias signal is influenced by advance information about the mere presence vs. absence of distractors (Exp. 1), or whether more specific information about the location of targets and distractors is necessary (Exp. 2 and 3). It turned out that mere information on distractor presence had no influence whatsoever, but that the prefrontal bias signal was expedited by the availability of location information. This indicates that the control mechanism reflected by this signal does not induce a general distractor-filtering mode, but rather a bias in the spatial allocation of memory resources.

An Interference Model of Visual Working Memory: Applications to Change Detection

Hsuan-Yu Lin & Klaus Oberauer
Department of Psychology, University of Zurich
h.lin@psychologie.uzh.ch

The studies of visual-working memory often employ change-detection task and continuous-stimulus reproduction task. In continuous-stimulus reproduction task, participants occasionally report the non-target items instead of the target. The presence of non-target response is particularly important for Interference Model which relies on the interference of non-target items to explain the set-size effect (Oberauer & Lin, 2017). In this study, we used single-probe change-detection task with stimulus from continuous dimension. By presenting the probe from the non-target item, we can investigate the amount interference from non-target item. Intrusion cost, the decrease of performance to reject the probe from the non-target items comparing to the new probe, was found and stayed relatively constant throughout the set sizes. We fitted the Interference Model along with Variable Precision and Slot-Averaging models to the result of change-detection task with Bayesian Inference rule similar to the one used in Keshvari, van den Berg, & Ma (2013). The Interference Model is successful in predicting the set-size effect and the constant intrusion cost, while the Variable Precision and Slot-Averaging models failed to predict the intrusion cost at all. Additional assumptions, e.g., a linear increasing of swap error with set sizes, are required for Variable Precision and Slot-Averaging models.

Hierarchy as a moderator of lateral attitude change: Values and policies

Roman Linne
Universität Bielefeld, Department of Psychology
roman.linne@uni-bielefeld.de

The lateral attitude change (LAC) model (Glaser et al., 2015) postulates that a hierarchical relationship between attitude objects moderates attitude generalization and displacement effects. This study investigated this moderator effect using the relation between the value equality and the policy gender-related affirmative action. Participants read an essay arguing either against the value or against the policy. Subsequently, participants rated both attitude objects which depending on condition served as focal or lateral object. Additionally, participants were asked to rate further lateral values and policies that varied in similarity to the focal objects. Results showed that an essay arguing against equality not only changed the attitude toward the focal object (equality) but also the attitudes toward lateral policies. Also, participants' confidence in their attitudes toward lateral values decreased. However, as expected, while having some effect on lateral policies, the essay arguing against gender-related affirmative action did not change the participants' attitudes toward lateral values. Effects on lateral attitudes were partly moderated by the degree of similarity to the focal object. These results support the hypothesis of stronger LAC effects when the focal object is at a higher hierarchical level than the lateral objects.

The effect of perceived similarity and perceived usefulness on online learning of statistics

Tuo Liu, Maria Mikheeva & Günter Daniel Rey
Chemnitz University of Technology, Psychology of learning with digital media
tuo.liu@s2015.tu-chemnitz.de

In multimedia learning, many instructional design guidelines have been developed to guide the learning processes and motivate the learners. According to social cognitive theory and cognitive and affective theory of multimedia learning, learning by observing pedagogical agents has a positive influence on the learning. This study investigated whether perceived similarity with the agent and perceived usefulness of the materials could influence the self-efficiency of learners, and finally enhance the learning outcomes. An experiment was performed, in which participants have learned fundamental concepts of multiple regression. The experimental process includes an introduction to the pedagogical agent with the picture, learning materials with audio comments from the agent and a knowledge test. A 2 × 2 between-subjects design was used with the factors "perceived similarity" (high vs. low) and "perceived usefulness" (high vs. low). Overall, sixty-five female students were randomly assigned to one of four groups. Results suggested that low perceived similarity led to significantly higher learning outcomes. Additionally, in the low perceived similarity condition, learner with high perceived usefulness had significantly higher self-efficiency than learner with low perceived usefulness. Possibly, the students could not identify them with the agent because the performance of the agent was not confident enough.

Articulatory information helps encode lexical contrasts in a second language

Miquel Llompart & Eva Reinisch
Ludwig-Maximilians-University Munich, Institute of Phonetics and Speech Processing
evarei@phonetik.uni-muenchen.de

The present study examined whether obtaining additional articulatory information about the sounds of a difficult second-language contrast (English /e/-/æ/ for German speakers) could help nonnative listeners to encode a lexical distinction between novel words containing these two categories. Novel words (e.g., tenzer-tandek) were trained with different types of input and their recognition was tested in a visual-world eye-tracking task. In Experiment 1, a baseline group was exposed to the words audio-only during training, whereas another group additionally saw videos of the speaker articulating the target words. In Experiment 2, listeners were asked to repeat the target words themselves as part of their training. It was found that both audiovisual input and word repetition during training resulted in asymmetric fixation patterns at test: Words containing /e/ were recognized more readily than those with /æ/, mirroring the recognition asymmetry reported for real English words. This asymmetry was not present for the audio-only group, in which target words with the two vowels were fixated similarly. The results suggest that articulatory knowledge, acquired through both passive exposure to visual information (Experiment 1) and active production (Experiment 2), can help distinguishing words with difficult foreign sounds.

The Impact of Emotions on Cognitive Processing during Text Learning

Kristina Loderer[1], Christof Kuhbandner[2] & Reinhard Pekrun[3]
[1]Ludwig-Maximilians-Universität München (University of Munich, LMU), Department of Psychology; [2]Universität Regensburg, Institut für Experimentelle Psychologie, Lehrstuhl für Psychologie VI; [3]Ludwig-Maximilians-Universität München (University of Munich, LMU), Department of Psychology; Australian Catholic University Sydney
Kristina.Loderer@psy.lmu.de

Extracting, organizing, and integrating information from texts is a staple form of learning. Given that prior research on emotions and cognitive processing in learning contexts has been primarily correlational or employed artificial rather than ecologically valid emotion induction techniques, this study examined effects of positive-activating, positive-deactivating, negative-activating, and negative-deactivating emotions on text learning induced via performance feedback,. In line with the control value theory of achievement emotions (Pekrun & Perry, 2014) we expected positive-activating emotions to enhance relational learning (i.e., integrating information) as assessed through a test measuring participants' recall of conceptually-related information (Chan et al., 2006). Negative-deactivating emotions, on the other hand, were expected to foster more item-specific processing, and deactivating emotions, particularly of negative valence, to impede learning altogether. Results of our 2x2 between-subjects experiment (N = 96 undergraduates) revealed that, contrary to our initial hypotheses, but in line with resource allocation models positing that positive-deactivating states take up less cognitive resources required for complex learning (Meinhardt & Pekrun, 2003), comparatively lower levels of activation were conducive to relational-integrative learning, whereas higher activation led to more item-specific processing. Descriptively, the former was most pronounced in the positive-deactivating condition. Implications for practice and future research are discussed.

Grounded Foresight: Anticipatory Remapping of Peripersonal Space During Object Interactions

Johannes Lohmann, Anna Belardinelli & Martin V. Butz
University of Tübingen, Cognitive Modeling
johannes.lohmann@uni-tuebingen.de

Theories of anticipatory, event-predictive control suggest that action preparation and initiation mechanisms activate desired, future goal states. Accordingly, sensorimotor processing should focus on upcoming control events and critical event boundaries, such as reaching and establishing a grasp for an object manipulation. Seeing the crucial role of relative spatial bodily encodings, and particularly peripersonal hand space in object interactions, we investigated whether these encodings are remapped into the future during action preparation and how this anticipatory remapping depends on the object orientation, and the reliability of sensorimotor contingencies. We conducted two experiments in an immersive virtual reality environment, combining the crossmodal congruency paradigm, which has been used to study selective interactions between vision and touch within peripersonal space, with an object manipulation task. We found significant crossmodal congruency effects between touch on the fingers and visual distractors close to the approximate future finger positions. In a second experiment, we additionally manipulated the visuo-motor mapping of the participants' virtual hand in order to manipulate the predictability of the movement outcome. The results confirm that the establishment of anticipatory remapping depends on movement outcome predictability. The results support theories of anticipatory, event-predictive control and show how prediction uncertainty constrains anticipatory processes.

Improving navigation systems. How design features of guidance systems influence survey and route knowledge

Lucas Lörch & Stefan Münzer
Universität Mannheim, Lehrstuhl Bildungspsychologie
lloerch@mail.uni-mannheim.de

Route guidance systems provide spatial information that supplement real-world experiences during wayfinding. The design features of the images displayed by these guidance systems influence the survey and route knowledge they convey. We conducted two experiments to test the influence of different design features on spatial knowledge. The first experiment took place in a virtual reality. During a learning phase, participants automatically moved through a virtual village. At each intersection, a navigation system appeared. In a subsequent testing phase, participants had to use their spatial knowledge of the village to complete a pointing task, a wayfinding task and a map completion task. The second experiment took place in a real, but unknown city. Participants walked a pre-defined route through the city and were instructed to look at a navigation system at each intersection. Afterwards, they had to complete a pointing task and a sketch-map task. In both experiments, the rotation of the map image, the zoom-level, the degree of schematization and the display of off-screen landmarks was manipulated. When data collection is finished, data of about 300 participants will be analyzed with mixed-model regressions. The results could provide new insights that are highly valuable for the research on spatial cognition.

Does Peer Observation Specifically Increase Mid-Adolescents Risky Decisions?

Corinna Lorenz & Jutta Kray
Universität des Saarlandes, Psychologie
corinna.lorenz@uni-saarland.de

Various studies on decision-making showed that mid-adolescents take more risky decisions when being observed by a peer, mostly investigated with a specific task (a driving scenario). Our aim was to investigate whether the peer effect can be generalized to another decision-making task. We used the Balloon Analog Risk Task (BART) in which participants can gain money by inflating balloons. Each pump increases the amount of gains but also increases the probability of a balloon to explode at an unknown explosion point and in turn to lose all the already collected money. Risk taking was measured by the number of pumps and the peer effect was assessed by comparing risk-taking in an alone condition and under the observation of a fictional online peer. Data of 154 participants (age range = 9-18 years) showed a peer effect, that is, higher number of pumps (i.e., increased risk-taking) under peer observation than in the alone condition. However, in contrast to previous findings, we did not find age differences in the peer effect. Hence, adolescents are not specifically prone to risky decision-making when observed by a peer, suggesting that the peer effect may be restricted to a specific type of task setting (driving scenario).

Does spectrum affect the implicit learning of an artificial musical grammar?

Joshua Lorenzen
Christian-Albrechts-Universität zu Kiel, Institut für Psychologie
lorenzen@psychologie.uni-kiel.de

In a past study we investigated the impact of a pitch scale's underlying tuning system on the implicit learning of an artificial harmonic grammar to investigate the role of small-integer frequency ratios. The results indicate the existence of a mental "general-purpose" syntax processor that can handle both musical and amusical material. In the current study, we used complex sounds instead of sine tones in order to study effects of a sound's overtone structure on the relation between tuning and learning outcome. Two different equal temperaments were compared: the Bohlen-Pierce scale and a new scale which does hardly allow small-integer frequency ratios. Subjects in either group listened over 30 minutes to 20 blocks of 18 different two-part sequences whose tone spectra were either matched to the respective scale (resulting in consonant intervals) or not (resulting in "diffuse" sounds). In a subsequent test phase, trained sequences were randomly presented with new grammatical sequences and ungrammatical sequences, and the participants were asked whether the sequences were old-grammatical, new-grammatical or new-ungrammatical. The results confirm the results of the previous study. There were no distinct effects of the matching of the spectrum to the respective scale.

Gaze and prior knowledge modulate allocentric coding in memory-guided reaching movement

Zijian Lu, Mathias Klinghammer & Katja Fiehler
Experimental Psychology, Justus-Liebig University Giessen
Fabio.Lu@psychol.uni-giessen.de

In this study we investigated the influence of gaze behavior and prior knowledge on the use of allocentric information for memory-guided reaching. Participants viewed a breakfast scene with six objects on the table (potential reach targets) and five objects in the background. Participants first encoded the scene and after a short delay a test scene was presented with one table object missing and one, three or five table objects horizontally shifted in the same direction. Participants performed a memory-guided reaching movement toward the position of the missing object on a blank screen. In order to examine the influence of gaze behavior, participants either freely moved their gaze (free-view) or kept gaze at a fixation point (fixation). The effect of prior knowledge was investigated by informing participants about the reach target either before (preview) or after (non-preview) scene encoding. Our results demonstrate that humans use allocentric information for reaching even if a stable retinal reference is available. However, allocentric coding of reach targets is stronger when gaze is free and prior knowledge about the reach target is missing. In sum, our findings suggest that both prior knowledge and gaze behavior can modulate the weighting of allocentric information.

An analysis of response times in probability judgments based on the Dual-Process Diffusion Model

Jonas Ludwig, Fabian Klaus Ahrens & Anja Achtziger
Zeppelin Universität Friedrichshafen, Department of Political and Social Sciences
jonas.ludwig@zu.de

Based on the Dual-Process Diffusion Model, the present research investigates three hypotheses about response times of errors and correct responses in a binary-choice judgment and decision making task. The model predicts that correct responses are slower than errors in case of conflicting decision processes but faster than errors in case of alignment. Further, the model predicts that correct responses in case of conflict are slower than correct responses in case of alignment. To test these predictions, we conducted a binary-choice experiment in which decision problems (i.e., probability judgments) elicited either conflict or alignment of a utility decision process and a heuristic decision process. In accordance with the traditional dual-process architecture, the utility process captures computational normative decision strategies, and the heuristic process describes rather intuitive-affective aspects of decision making. The results support the hypotheses. This evidence strengthens the predictive validity of the Dual-Process Diffusion Model and suggests that decision processes in binary-choice tasks can be appropriately modeled as diffusion processes of evidence accumulation.

The usefulness of task-irrelevant actions-effects in implicit sequence-learning

Clarissa Lustig & Hilde Haider
University of Cologne, Department of Psychology
clarissa.lustig@uni-koeln.de

In previous experiments, we found that a sequence of task-irrelevant effect-tones can be learned implicitly when it is not consistently bound to the responses. However, replicating these findings with visual effects led to mixed results (Lustig & Haider, in preparation). One possible explanation is that visual effects interfere with the visual targets as both are presented in the visual modality (e.g. Mayr, 1996 (parallel learning); Posner, 1980 (location-dependent attention)). However, it is unclear whether the visual-effect sequence is learned (Kunde et al., 2004) but due to interference inhibited during training (Cock et al., 2002) or whether it is not learned at all. To investigate this question, participants performed a serial reaction time task (Nissen & Bullemer, 1987) without any sequence except a visual effect sequence. Either letters within or shapes around possible target-locations served as visual effects. First results indicate that participants in both groups had learned the effect-sequence. However, while the letter-group showed overall shorter reaction-times, only the shape-group showed a significant increase of latencies when replacing the effect sequence. Thus, inhibition of interfering effects decreased their influence on performance but enhanced processing of task-relevant information.

Unterschiedliche Verfahrung zur Messung von Workload am Arbeitsplatz: Ein Methodenvergleich

Sebastian Mach, Jan Philipp Gründling, Franziska Schmalfuß & Josef F. Krems
Chemnitz University of Technology, Professorship of Cognitive and Engineering Psychology
sebastian.mach@psychologie.tu-chemnitz.de

Trotz zunehmender Digitalisierung und Vernetzung im Rahmen von Industrie 4.0 wird auch zukünftig der Industriearbeiter eine wichtige Rolle spielen. Im Forschungsprojekt „Factory2Fit“ (gefördert durch die EU im Rahmen von Horizon2020, Vertragsnummer 723277) werden Automatisierungslösungen für die Fabrik der Zukunft entwickelt, bei denen der Arbeiter im Zentrum steht. Dabei sollen über eine Schnittstelle von Mensch und Automation die Bedürfnisse und Präferenzen der Mitarbeiter in Echtzeit berücksichtigt werden. Ein Zugang stellt die Erfassung psychischer Zustände mittels Fragebögen dar. Als Schnittstelle soll eine Smartwatch verwendet werden. In einem ersten Experiment untersuchten wir die Übereinstimmung verschiedener Darstellungsformen des NASA-TLX, präsentiert als Papierfragebogen und als Anzeige auf der Smartwatch. Neunundzwanzig Probanden mussten kontinuierliche Kopfrechenaufgaben mit drei unterschiedlichen Schwierigkeitsstufen bearbeiten. Nach jeder Aufgabe wurde der NASA-TLX ausgefüllt, wobei variiert wurde zwischen der Eingabe über die Lünette der Smartwatch, über Touch-Eingabe und dem Ausfüllen in Papierform. Die Ergebnisse zeigten einen signifikant niedrigeren Mentalen Workload Score bei der Papierversion im Vergleich zur Lünetten- bzw. Touch-Eingabe. Jedoch konnten die relativen Unterschiede zwischen den verschiedenen Aufgabenschwierigkeitsgraden in jeder Bedingung adäquat abgebildet werden. Die Befragung via Smartwatch eignet sich somit, um zwischen unterschiedlichem Mentalen Workload differenzieren zu können und besitzt damit großes Potenzial für den Online-Einsatz im Industrieumfeld.

Human Visual Grasp Selection

Guido Maiello, Lina K Klein, Vivian C Paulun & Roland W Fleming
Justus-Liebig University Gießen, Department of Experimental Psychology
Guido.Maiello@psychol.uni-giessen.de

The apparent ease with which we grasp objects every day masks the complexity of computations underlying visual grasp selection. Despite extensive literature describing human grasping patterns and movement kinematics, little is understood about the computational basis of human grasping. In a set of behavioral experiments, we asked participants to execute precision grasps to 3D objects of varying shape, weight and surface properties. By measuring distances between different grasps on the same object, we found that grasp patterns were highly consistent across participants (81.5% [77.5-84.9; 95% CI] consistency). Grasping patterns were modulated by object shape, overall mass as well as mass distribution, length of reach trajectory, and the orientation of the object relative to the participant. Starting from these insights we constructed a model of human grasp selection. Through a series of computational steps our model searches for grasps that maximize grasp stability and comfort. Our model reaches a remarkable level of agreement with human participants of 82.2% [76.6-87.1; 95% CI]: the model's grasping patterns are effectively as similar to human grasping patterns as human grasps from different subjects are to one another. Our work thus describes a data- and theory-driven approach to understand the computations underlying human grasping.

Pupil dilation predicts adaptive behavioral adjustments following different error types

Martin E. Maier, Benjamin Ernst & Marco Steinhauser
Katholische Universität Eichstätt-Ingolstadt
martin.maier@ku.de

Pupil dilation as a measure of autonomic arousal has been shown to predict adaptive adjustments of performance following behavioral errors. Here, we investigated whether this process is also sensitive to different types of errors. In previous studies, we used a four-choice flanker task in which errors occur either by pressing a button associated with the distractors (flanker errors), or by pressing a button not associated with the stimulus at all (nonflanker errors). The error-related negativity, an electrophysiological marker of early error monitoring in the medial frontal cortex, was increased for flanker errors implying that the medial frontal cortex evaluates the type of error at an early time point. In the present study, we show that, just like the error-related negativity, pupil dilation following errors is increased for flanker errors and that this effect predicts post-error slowing of response times and increase of response accuracy following errors on a single-trial level. This suggests that the evaluation of error type contributes to adaptive adjustments of response strategy following errors by modulating autonomic arousal.

Mere selection increases the value of known products

Nadiia Makarina[1], Ronald Hübner[2] & Sebastian Dummel[3]
[1]University of Konstanz, Cognitive Psychology and GSDS; [2]University of Konstanz, Cognitive Psychology;
[3]Universität zu Köln, Differentielle Psychologie und Psychologische Diagnostik
nadiia.makarina@uni-konstanz.de

It is usually assumed that consumers base their choice between products on the expected benefit provided by the products. However, there is evidence that the mere selection of a product also increases preference for this product. In a study by Janiszewski, Kuo, and Tavassoli (2013; Journal of Consumer Research), participants had to select targets in a visual search task. As a result, in a subsequent preference choice task former targets were preferred to former non-targets. For detecting the relatively small increase in preference, they had to construct pairs of products that originally were equal in value. This was achieved by using products that were unknown to the participants. However, this method questions the generality of the mere selection effect. In the present study, we therefore used known products as stimuli. The construction of equal-value pairs for the preference choice task was based on preference ratings obtained in an independent preliminary study. In two experiments with this method, we not only replicate and generalize the mere selection effect, but also show that a selected product can increase in value.

Is there a SMARC effect for tones "without" different pitch height?

Stephanie Malek & Torsten Schubert
Martin Luther University Halle-Wittenberg, Psychology Department
stephanie.malek@psych.uni-halle.de

Pitches of musical tones can be ordered from low to high and they are mentally represented along a spatial vertical axis. The effect of spatial–musical association of response codes (SMARC effect) denotes the observation that participants respond faster on pure tones with high frequencies when pressing an upper response key compared to a lower response key and vice versa for situations with low frequency tones. However, for the case of Shepard tones (Shepard, 1964) tone pitch cannot be adequately represented on a linear scale, but rather on a circular representation, with no start and end of the scale. This predicts that there should be no SMARC effect, when participants respond on Shepard tones with vertically ordered response keys. We tested this assumption with a same-different paradigm, in which participants decided whether the pitches of a constant reference and variable comparison tone were similar or different in pitch by pressing an upper or lower response key. Tones were presented in two tonal conditions: as pure tones and Shepard tones. We found a SMARC effect for pure- and Shepard tones. Differences in the response patterns of pure and Shepard tones will be discussed.

Impaired implicit acquisition of spatial context information during increased arousal

Thomas Maran, Simon Liegl, Lucas Haraped & Pierre Sachse
General and Experimental Psychology, Department of Psychology, University of Innsbruck
thomas.maran@uibk.ac.at

Increased arousal promotes a shift from a hippocampus-based 'cognitive' strategy towards a striatum-based 'habit' strategy underlying cognition, promoting a supersession of flexible thinking by inflexible habits. Spatial processing, as one core function of the hippocampus-centered 'cognitive' system, should also be affected by this cognitive adaptation, specifically when spatial information is encoded implicitly. Our study aims to test, whether implicit acquisition of spatial context information is impaired within states high in arousal. We tested 84 participants (56 female) using the spatial discrimination paradigm in a 3×5 factorial design with three arousal states (moderate arousal, high appetitive arousal, high aversive arousal) as a between-subject variable and five lure displacements as a within-subject variable. Results indicate an impairment of spatial context acquisition for arousal groups, regardless of their motivational direction. These findings are in line with recent studies showing a stress-driven impairment of spatial cognition and extend existing findings showing disrupted implicit acquisition of spatial context during high arousal states. We suggest, that these effects reflect a cognitive shift towards resource-saving and present-oriented reflexive processing within challenging situations, enabling fast responses, but impairing the construction of a situational model based on contextual details.

Ping-pong: attentional mechanisms during visual and linguistic encoding

Ines Marberg & Johannes Gerwien
University of Heidelberg, Institute for German as a Foreign Language Philology
ines.marberg@gmx.de

What happens at the interface of visual scene perception and language planning? How are attentional resources distributed between the two processes? Both are known to start rapidly after the onset of a stimulus and overlap in time, posing a challenge to researchers on vision and language. If we manage to investigate crosslinguistic typological influences on early information processing after the onset of a visual scene, this could reveal more about how conceptualization for language production and visual attention interrelate. I will present a new experimental approach that exploits masked content-changes in the middle of short (560 ms) naturalistic video scenes during an event description task (German/French). These changes possibly pass unnoticed due to the phenomenon of change blindness. At the same time, the change provides an indicator for the time of information processing (uptake, consolidation, update/monitoring). Analyses of the linguistic data reveal how subjects accommodate to seemingly unnoticed changes and, thus, an effect of language on the encoding of the manipulated objects may be detected. Building on the experimental results and existing literature I will propose that attentional resources are allocated in an oscillatory fashion and guided by conceptual frames structured by language.

Post-learning attentional resource consumption weakens memory retention

Markus Martini, Robert Marhenke & Pierre Sachse
University of Innsbruck
markus.martini@uibk.ac.at

Memories are vulnerable to distraction after its acquisition. The majority of studies indicate that a brief period of wakeful rest after learning supports memory retention, whereas a resource demanding distractor task weakens it. However, a beneficial effect of resting was not always found. We tested the resting effect with a distractor task that put continuously high demands on selective attentional processes, while memory load was held at a minimum. Participants were involved in two consecutive word list learning and immediate recall phases. After one learning and recall phase, participants rested for 8 min, after the other, they worked on the distractor task. A delayed surprise free recall test took place at the end of the experimental session. Our results showed that more words were retained in the rest condition compared to the attentional demanding distractor condition. We discuss our findings in the light of recent findings with a focus on post-learning distractor task-specific processes and their impact on memory consolidation.

A common, grounded basis for different types of stimulus-response learning

Torsten Martiny-Huenger
UiT The arctic university of Norway, Department of Psychology
torsten.martiny-huenger@uit.no

Whereas stimulus-response (S-R) associations are traditionally established in the presence of relevant perceptions and actions, there is growing evidence that similar associations can be formed in the absence of actual action (e.g., by if-then action planning, instructions, observation). I will argue that both types of S-R learning have a common basis. The argument is based on theories of embodied cognition, in which it is proposed that higher cognitive functions (e.g., comprehension of verbal content) are based on simulations in sensorimotor brain areas. These brain areas are also assumed to play a dominant role in S-R learning based on actual perception and action. Thus, it can be argued that Hebbian associative mechanisms in sensorimotor brain areas are the basis for both types of S-R learning. The only difference concerns how these specific activity patterns in sensorimotor areas are activated. Traditionally, they are understood to be activated by actual stimulus perception and response execution. In the absence of actual actions, they are activated by secondary stimuli – specific verbal content that is itself strongly linked to the respective activity patterns in sensorimotor areas. Thus, an embodied cognition perspective can provide a common and parsimonious explanation for different types of S-R learning.

Low complexity of syllables drives preference effects for words

Ira Maschmann
University of Cologne, Department Psychology, Social Cognition Center Cologne
ira.maschmann@uni-koeln.de

Processing of language depends on various features of individual words, such as their frequency, length, and complexity. These characteristics influence among other features the ease with which a word is being processed. This so-called processing fluency has been shown to impact attitudes towards (nonsense) words. Complexity of words can be manipulated through the mere composition of words out of syllables: the most basic and high-frequent syllable in all languages constitutes an open syllable with the structure consonant-vowel (CV), whereas less frequent syllables contain consonant clusters (e.g., in the form of CCCV). Words that merely consist of open syllables should be preferred over words that contain complex consonant clusters, since the first are fundamental and most frequent within language and therefore easiest to process. In one experiment the impact of high-frequent, open syllables on word liking was tested (N = 309). Number of syllables and letters were manipulated orthogonally for words that started with a consonant and ended with a vowel, respectively. Results support the hypothesis that words consisting of open syllables are liked over words consisting of any other combination of syllables. The impact of frequency and fluency on this preference effect are being discussed.

Does pupil size influence subjective brightness perception?

Sebastiaan Mathôt[1] & Intan Wardhani[2]
[1]University of Groningen, Department of Experimental Psychology; [2]University of Groningen, Department of Experimental Psychology; The Netherlands University of Oslo, Department of Psychology
s.mathot@cogsci.nl

The human pupil can change light influx by a factor of sixteen. Yet we do not perceive the world to become darker or brighter whenever our pupils get bigger or smaller. In daily life, brightness constancy is supported by many indirect cues, such as the knowledge that the brightness of most objects is constant. Here we asked whether, in the absence of such indirect cues, pupil size does influence subjective brightness. We performed two experiments in which participants judged the relative brightness of a tester stimulus compared to a referent stimulus. We manipulated pupil size during the presentation of the tester in different ways: by varying the difficulty of a secondary task (mental effort induces large pupils; Exp. 1); or by presenting a red or blue stimulus (red light induces larger pupils than equiluminant blue light; Exp. 2). We found that large pupils were associated with an underestimation of the tester's brightness; that is, larger pupils may cause things to appear darker, possibly because of the strong association between large pupils and darkness. However, more studies, using different methods, are needed to confirm the link between subjective brightness and pupil size.

Fatigue and Resting Related Changes in a Dual-two-Back Task

András Matuz[1], Orsolya Simon[1], István Hernádi[2], Zsolt Kisander[1], Kázmér Karádi[1] & Árpád Csathó[1]
[1]University of Pécs, Institute of Behavioural Sciences; [2]University of Pécs, Department of Experimental Neurobiology
andras.matuz@aok.pte.hu

Mental fatigue induced by increasing Time-on-Task (ToT) has been found to affect many cognitive operations. However, only a very few studies examined the effects of fatigue on tasks with non-visual or bimodal sensory stimuli. Therefore, in one experiment, we tested how ToT affects dual-task performance with visual and auditory stimuli. We adapted a bimodal 2-back task for ToT paradigm [Gatekeeper task; Heatcote et al, 2015, Memory and Cognition, 43]. Participants were presented with pairs of visual and auditory stimuli, and target-response was required if a stimulus in either modality was identical to that shown two trials earlier. The experiment had two main phases. First, participants (N = 20) performed the Gatekeeper task for 1.5 hours without rest (1500 trials in total). Subjective fatigue, reaction time, error rates, and electrocardiogram were recorded. Second, participants had a resting period (12 minutes) followed by an additional block of trials. The analyses yielded increased subjective fatigue and compromised performance with increasing ToT. After resting, performance was significantly improved. In addition, the heart rate decreased while the heart rate variability increased over the duration of the experiment. Results will be discussed in terms of the motivational and capacity accounts of mental fatigue.

The influence of different sensory signals on error perception and its neural correlates

Lisa K. Maurer, Michael Joch, Mathias Hegele, Heiko Maurer & Hermann Müller
Justus-Liebig-University, Department of Sport Science
michael.joch@sport.uni-giessen.de

In a series of three EEG studies, we investigated the influence of sensory signals, coming from different modalities, on the amplitude of ERPs related to error-prediction (ERN) and result-feedback reaction (FRN). As a motor task, a semi-virtual throwing task was used. With respect to error-prediction, we found that action effect monitoring is not a prerequisite for outcome prediction. Furthermore, the restriction of proprioceptive signals in an observation condition reduced the ERN amplitude but it was still observable. However, removing visual signals about movement execution and planning led to a drastic decrease in the prediction´s reliability and the amplitude of the ERN. Referring to the reaction to result feedback, our results support the assumption of a complementary behavior of the ERN and FRN. In detail, we find smaller FRN amplitudes when the ERN previously arose (motor system is aware of an upcoming error) and vice versa. Summing up, our results let us assume that the ERN scales with the reliability of the internal model´s outcome prediction. Sensory input signals are differently weighted by the prediction model and a removal of these signals results in a reduced to not existent ERN amplitude and, in consequence, to a larger FRN amplitude.

Commonalities and differences of auditory and visual negative priming

Susanne Mayr[1] & Axel Buchner[2]
[1]University of Passau, Chair of Psychology and Human-Machine Interaction; [2]Heinrich Heine University Düsseldorf, Cognitive and Industrial Psychology
susanne.mayr@uni-passau.de

The negative priming effect—that is, the slowed-down and/or more error-prone responding to a previously ignored stimulus—has traditionally been investigated in the visual domain. A far smaller number of studies have focused on auditory negative priming. Whereas the overall picture suggests that the same principles underlie the effect in both modalities, there are also several instances of clear differences between auditory and visual negative priming. Based on two decades of research on auditory negative priming we briefly touch upon commonalities with the visual domain and then focus on areas in which the auditory domain is distinctly different from the visual domain. We will cover mainly, but not exclusively, issues of spatial (as opposed to identity) negative priming, episodic retrieval of response information, and strategic modulation. Whereas findings with respect to these issues seem to reflect consistent and general differences between auditory and visual processing, there are also some unique findings in auditory negative priming for which a conclusive explanation has yet to be found.

Executive Control and the Implicit Association Test (IAT): Unraveling the Effect of Switching Ability on IAT Scores

Franziska Meissner
Friedrich-Schiller-Universität Jena, Institut für Psychologie, Allgemeine Psychologie II
franziska.meissner@uni-jena.de

Although the Implicit Association Test (IAT) was introduced as a measure of evaluative associations, IAT scores also vary with different levels of executive control, such as task-switching ability: The higher the switching ability, the smaller the IAT score. The underlying processes, however, are still largely unknown. In two studies, I tested the assumption that recoding, a simplification of the classification task, is responsible for the effect. If recoding occurs, participants no longer switch between tasks in compatible blocks. Hence, higher switching abilities should be accompanied by smaller IAT scores to the extent that participants engage in recoding. In Study 1, I manipulated recoding by comparing a standard IAT and a recoding-free IAT. As hypothesized, switching ability correlated with IAT scores in the former but not in the latter condition. In Study 2, the moderating influence of recoding was replicated within a single IAT by applying the ReAL model (Meissner & Rothermund, 2013). This multinomial model prevents false conclusions by quantifying associations, recoding and other processes underlying the IAT score in separate parameters. In the current study, model analyses also provided insights into processes mediating the effect of switching ability on the IAT score. Implications for IAT applications are discussed.

Kindermörder! Eine experimentelle Untersuchung zur Verfälschbarkeit von Selbstauskünften in indirekten Befragungen

Julia Meisters, Adrian Hoffmann & Jochen Musch
University of Duesseldorf, Department of Experimental Psychology
julia.meisters@uni-duesseldorf.de

Auf dem „Crosswise Model" (CWM; Yu, Tian & Tang, 2008) beruht eine indirekte Fragetechnik, welche die Vertraulichkeit von Antworten auf sensible Fragen garantiert. Die Verwendung dieser experimentellen Technik führt zu valideren Schätzungen für die Prävalenz sensibler Merkmale als direkte Fragen; sie zeichnet sich außerdem durch eine im Vergleich zu anderen indirekten Verfahren leichte Verständlichkeit aus (Hoffmann & Musch, 2016; Hoffmann, Diedenhofen, Verschuere & Musch, 2015). Wir haben zunächst untersucht, ob sich mit Hilfe der Technik Einflüsse sozialer Erwünschtheit auf Selbstauskünfte zum Vorbildverhalten im Straßenverkehr kontrollieren lassen. Erwartungsgemäß führte das CWM zu höheren und damit potentiell valideren Prävalenzschätzungen für das von Kindern beobachtete Überqueren einer roten Ampel als eine direkte Frage. Darüber hinaus erwiesen sich Prävalenzschätzungen mit dem CWM im Vergleich zu direkten Fragen als weniger anfällig für eine bewusste Verfälschung. Bei einer direkten Befragung führte eine „fake good"-Manipulation zu einer deutlich geringeren Prävalenzschätzung für das sensible Merkmal; in der CWM-Bedingung veränderte eine „fake good"-Instruktion die Prävalenzschätzung nicht. Dieses Ergebnismuster belegt die Robustheit des CWM sogar gegenüber einer bewussten Verfälschungsabsicht. Diese Robustheit wird auf die Antwortsymmetrie des Verfahrens zurückgeführt, aufgrund derer es keine „sicheren" Antwortoptionen gibt, mit deren Hilfe die Teilnehmer eine Trägerschaft des sensiblen Merkmals zuverlässig ausschließen können.

Elegance – a concept completely disregarded in empirical aesthetics

Winfried Menninghaus[1], Valentin Wagner[1], Vanessa Kegel[1], Christine A. Knoop[1] & Wolff Schlotz[2]
[1]Max-Planck-Institute for Empirical Aesthetics, Department of Language and Literature; [2]Max-Planck-Institute for Empirical Aesthetics, Labs and Methods
valentin.wagner@ae.mpg.de

In a series of studies we analyzed the perceptual correlates of elegance as well as its social, cognitive, affective, and aesthetically evaluative implications. Using a variety of methods (free association, semantic differentials, corpus-linguistic analysis, and statistical methods of image analysis), we introduce "elegance" as a key concept of aesthetics. To date, it is completely disregarded in empirical aesthetics. It has, however, great potential to add higher granularity to the conceptual fundament of the field, for instance, by sharpening the very broad concept of beauty through comparing it with elegance.

ABrox - a graphical user interface for approximate Bayesian computation

Ulf Mertens, Andreas Voss & Stefan Radev
Heidelberg University, Quantitative Research Methods
ulf.mertens@psychologie.uni-heidelberg.de

As mathematical models to describe psychological phenomena become more and more complex, traditional methods for statistical inference might come short. Approximate Bayesian Computation (ABC) is a computational method founded in Bayesian Statistics that encounters one potential problem. Specifically, it enables parameter estimation and model comparison when the likelihood function, expressing the probability of observed data under the model of consideration, is unknown or computationally intractable. The idea of ABC is to bypass the computation of the likelihood function by comparing model predictions with observed data, thus taking a simulation-based approach. We introduce ABrox, a python module for ABC methods accompanied by a graphical user interface (GUI). The GUI makes both model comparison and parameter inference easy to handle. Users can choose among several algorithms for both tasks. With ABrox, researchers with a basic knowledge of Python can implement their models easily using the GUI. Alternatively, it is also possible to use ABrox directly within Python (i.e., without the GUI), which may be preferable for advanced programmers.

Implied tactile motion: Localizing dynamic stimulations on the skin

Simon Merz[1], Hauke S. Meyerhoff[2], Charles Spence[3] & Christian Frings[1]
[1]University of Trier; [2]Leibniz-Institut für Wissensmedien; [3]University of Oxford
merzs@uni-trier.de

We report two experiments designed to investigate how implied movement during tactile stimulation influences localization on the skin surface. Understanding how well tactile sensations can be localized on the skin surface is an important research question for those working on the sense of touch. Interestingly, however, the influence of implied motion on tactile localization has not been investigated before. Using two different experimental approaches, an overall analogue pattern of localization shifts to the visual and auditory modality is observed. That is, participants perceive the last location of a dynamic stimulation further along its trajectory. In Experiment 1, participants judged whether the last vibration in a sequence of three vibrations was located closer to the wrist or elbow. In Experiment 2, participants indicated the last location on a ruler which was attached to their forearm. We further pinpoint the effects of implied motion on tactile localization by investigating the independent influences of motion direction and perceptual uncertainty. Taken together, these findings underline the importance of dynamic information in localizing tactile stimuli on the skin. These results also indicate modality specific-differences in the localization of approaching vs. receding stimuli, hinting at different functions of localization in different modalities.

Reviewing evidence for superior unconscious processing - Do we really perceive more than we know?

Sascha Meyen, Ulrike von Luxburg & Volker H Franz
Eberhard Karls University of Tübingen, Department of Computer Science
sascha.meyen@uni-tuebingen.de

Many studies found that humans can not consciously perceive a masked prime stimulus when directly asked to discriminate it in a direct task. Nevertheless, the masked prime can affect responses such as reaction times in indirect tasks where the prime is not task relevant. This dissociation led to the interpretation that the prime is better processed unconsciously (in the indirect task) than consciously (in the direct task). We applied signal detection theory to re-analyze the empirical findings of several highly influential studies. Surprisingly, most results are to be expected under the assumption of equal processing capabilities for the prime in direct and indirect tasks. The seeming dissociation is caused by (a) a larger number of trials in the indirect task and by (b) measuring a continuous response in the indirect task, while restricting participants to a binary classification in the direct task, which disadvantages the direct task. Such results do not suffice as indicators for superior unconscious processing. Nevertheless, some studies survived our test and found a dissociation between direct and indirect task not caused by methodological issues. These studies used relatively simple visual stimuli. We hypothesize that a dissociation might exist only for simple stimuli.

Visual dominance in long-term memory for naturalistic scenes: Evidence from study-test congruency experiments

Hauke S. Meyerhoff[1], Frank Papenmeier[2] & Markus Huff[3]
[1]Leibniz-Institut für Wissensmedien; [2]University of Tübingen, Department of Psychology; [3]Department of Research Infrastructures, German Research Institute for Adult Education
h.meyerhoff@iwm-tuebingen.de

Memory performance is more accurate for audio-visual rather than purely visual scenes. In previous work, we have observed evidence for the integration of audio-visual information into a common memory representation. In the present project, we explore the nature of this memory representation by manipulating study-test congruency. Our participants memorized a large set of brief excerpts from Hollywood movies that were presented either audio-visually or purely visual. One day later, they performed an old/new recognition task. One half of all targets were presented as during study whereas the other half switched the presentation condition thus violating study-test congruency. Although targets that were presented audio-visually during study and test elicited the most accurate memory performance, there was no benefit of targets that were presented visually during study and test relative to the conditions that violated study-test congruency (e.g., visual during study and audiovisual during test). However, we were able to obtain a full study-test congruency effect with our paradigm when we tested audio-visual vs. purely auditory scenes. Therefore, our pattern of results indicates visual dominance in human long-term memory representations.

Distractor-induced Deafness

Lars Michael & Maria Robaina Fernández
Medical School Berlin, Department Psychology
lars.michael@medicalschool-berlin.de

To track the transition from unconscious to conscious representation of stimuli a new paradigm has been proposed; the paradigm of distractor induced blindness (DIB). Previously the paradigm has been used in visual motion stimuli, supporting the idea that distractors, which share the target's feature, trigger a cumulative inhibition process preventing the conscious representation of a target under temporary conditions (Michael et al., 2012). This data has been proved in various ERP-studies, showing a frontal negativity related to the inhibitory process of the target's feature. With increasing number of distractors an increasing negative potential placed in the prefrontal cortex was observed (Niedeggen et al., 2012). As it seems to be a higher-level cognitive process, we used a variation of the paradigm in the auditory modality to explore DIB in another sensory modality. Participants (n= 19) had to detect a salient tone (target) in an stream with coherent and incoherent distractors. The resulting behavioural data showed the appearance of DIB using auditory distractors. With increasing number of auditory coherent distractors a lower detection performance of the target was observed. This supports the notion of a central inhibition process that can deploy regardless of the sensory system.

"Entschuldigen Sie, dass ich Ihnen einen komplizierten Artikel schreibe; für einen lesbaren habe ich keine Zeit"

Meik Michalke
Heinrich-Heine-Universität, Abteilung für Diagnostik und Differentielle Psychologie
meik.michalke@hhu.de

Die Lesbarkeit von Texten ist im Informationszeitalter von zunehmender Bedeutung. Es genügt nicht, Wissen zu verschriftlichen; die resultierenden Texte müssen auch verständlich sein. Zahlreiche Verfahren wurden vorgeschlagen, um die Lesbarkeit eines Textes aus leicht zu erfassenden Merkmalen zu errechnen. Zu diesen Merkmalen gehört beispielsweise die durchschnittliche Wort- und Satzlänge sowie die Häufigkeit von Fremdwörtern. Das R-Paket 'koRpus' analysiert Texte und implementiert dabei neben Maßen der lexikalischen Diversität auch mehr als 20 Lesbarkeitsformeln, einige davon in mehreren Varianten. Seit seiner Erstveröffentlichung im Jahr 2011 hat sich 'koRpus' zu einer mächtigen Werkzeugsammlung entwickelt, die interdisziplinär in Forschungsprojekten verwendet wird. Vorgestellt werden die Features und die praktischen Einsatzmöglichkeiten von 'koRpus' und den ergänzenden Paketen 'tm.plugin.koRpus' und 'sylly'. Hierzu gehören Analysen von einzelnen Texten bis hin zu hierarchisch geordneten Textsammlungen (z.B. Gebrauchsanweisungen, politischen Reden, journalistischen Texten), die Auswahl und Aufbereitung von Stimulusmaterial für empirische Studien, sowie die automatische Bestimmung der Sprache, in der ein Text geschrieben ist.

Gender effects on cooperation and costly punishment

Laura Mieth, Axel Buchner & Raoul Bell
Heinrich Heine University, Department for Experimental Psychology
laura.mieth@hhu.de

Women are believed to be more cooperative and less egoistic than men. In three experiments, we examined whether people punish women for failing to live up to this benevolent stereotype. Participants played a prisoner's dilemma game with female and male partners which was followed by a costly punishment option. Participants could spend money to decrease their partners' payment. In Experiment 1, participants spent more money to punish defective behavior of female partners than that of male partners. However, this effect of partner gender on punishment was indirect rather than direct: Participants cooperated more likely with female partners than with male partners, so that they had more opportunity for moralistic punishment. In Experiments 2 and 3, we also examined differences between female and male participants in cooperation and punishment of female and male partners. Whereas female participants cooperated more with female partners than with male partners, male participants treated female and male partners equally. Female participants differed from male participants in that their decisions can be considered more social and less rational from an economic point of view, consistent with social-role theory and evolutionary accounts.

The influence of decorative pictures on online learning of mathematics

Maria Mikheeva, Günter Daniel Rey & Maik Beege
Chemnitz University of Technology, Psychology of learning with digital media
maria.mikheeva@phil.tu-chemnitz.de

Mathematics is an obligatory subject for many university students. Because of the high level of abstractness, mathematical tasks are especially difficult to solve for students. This study examined if adding decorative pictures in the learning texts can lower cognitive load and improve learning outcomes in mathematical tasks. Although decorative pictures hindered learning in many studies, the pictures might enhance the learning outcomes if they induced learning-relevant emotions and were integrated into the context of learning. With this aim, an online experiment with logarithmical tasks was carried out. The experimental part consisted of two sections each with an emotional decorative picture, learning text and questions. A 2 × 2 between-subjects design was used with the factors "picture in the first section" (negative vs. positive) and "picture in the second section" (negative vs. positive). Overall, 92 students were randomly assigned to the four groups. The results showed no influences of experimental factors on learning outcomes, cognitive load or emotions. Possibly, the decorative pictures should be shown on an additional navigation page to be seen more often. Summarizing, decorative pictures were neither helpful nor harmful to the learning.

Two routes to aesthetic preference, one route to aesthetic inference

Chantal Allegra Miller & Ronald Hübner
University of Konstanz, Department of Psychology
chantal-allegra.miller@uni-konstanz.de

Aesthetic preferences vary strongly between people across all kinds of aesthetic objects. Yet, whole sectors of industry are engaged in predicting what the majority of people aesthetically prefers. In the present study, we investigated the ability of people to infer other´s beauty judgements as well as the underlying processes. Because aesthetic preference depends on affective-based as well as cognitive-based processes, we asked 40 participants to rate 24 artworks on the dimensions beauty, cognitive stimulation, and emotionality. Additionally, participants had to infer other people´s assessments concerning the same stimuli and dimensions. Whereas in the self-assessment condition beauty correlated positively with emotionality as well as cognitive stimulation (no correlation between emotionality and cognitive stimulation), in the others-assessment condition beauty correlated highly only with emotionality. An inter-assessment correlation revealed that about half of the participants presented a medium to high correlation between their own others-assessments and the other participant´s self-assessments. Taken together, our results indicate that the ability to infer other´s aesthetic preferences exists, and that preferences for concrete artworks are inferred via emotional appraisal, not via appraisal of cognitive stimulation.

How age and attractiveness influence visual attention

Aleksandra Mitrovic & Helmut Leder
University of Vienna, Department of Basic Psychological Research and Research Methods
aleksandra.mitrovic@univie.ac.at

In everyday life, faces surround us. We know that faces and especially attractive faces capture and bind visual attention. In this study, we were interested in how this effect is modulated by age. To answer this question, we presented 15 groups of four images each, showing female faces, to male perceivers. Each quadruple consisted of one more and one less attractive younger and one more and one less attractive older face (attractiveness matched across age categories). Participants looked at the quadruples for 20 seconds while we recorded their eye movements. In subsequent blocks, the quadruplets were presented again and participants rated (a) how much they want to go on a date with the depicted face (desire/wanting) and (b) how much they like the depicted face (pleasure/liking). In line with our expectations, we found that more attractive, younger faces were rated highest according to wanting and liking and were looked at the longest. Additionally, less attractive, younger faces were rated second highest overall in regards to wanting whereas more attractive, older faces were rated second highest overall in regards to liking. Thus, the age was more important in respect to wanting whereas the attractiveness was more important for liking.

Effects of Emotional Victim Responses on Aggressive Behaviour

Vanessa Mitschke[1], Mario Gollwitzer[2] & Andreas B Eder[1]
[1]University of Wuerzburg, Department of Psychology; [2]Philipps-Universität Marburg, Department of Psychology
vanessa.mitschke@uni-wuerzburg.de

Aggressive acts are carried out with the intention to harm another person. Consequently, the aggressor has to monitor the victim to match perceived and desired harm doing for a regulation of aggressive acts. There is an ongoing discussion whether the aggressor wants to see the victim suffer in a comparable way or if the aggressor wants to deliver a particular message with retaliative punishment. For a test, we modified a competitive reaction time aggression paradigm that included controlled emotional victim feedback via video clips. Participants were provoked and given the opportunity to punish their opponent. The punishment was followed by a short video clip featuring three distinct emotional reactions of the opponent: (1) anger, (2) sadness, (3) pain, (4) and neutral displays. We compared the punishment intensity that was selected by the aggressor in the trials preceding and following the emotional victim feedback. Results showed that the victims' pain displays decreased punishment intensity most relative to the other displays. The results suggest that displays of suffering (pain) have the strongest effect on revenge-seeking motivations.

Temporal predictability of between-task interference in dual tasking: Foreperiods as contextual cues modulate the backward compatibility effect

Victor Mittelstädt[1], Andrea Kiesel[1], Rico Fischer[2], Tobias Rieger[1] & Roland Thomaschke[1]
[1]University of Freiburg, Department of Psychology; [2]University of Greifswald, Department of Psychology
victor.mittelstaedt@psychologie.uni-freiburg.de

In dual-task studies, Task 1 (T1) processing is often influenced from between-task interference caused by Task 2 (T2) processing. The backward compatibility effect (BCE), for example, shows that Task 1 performance is impaired when the two tasks require spatially incompatible compared to compatible responses. In the present study, we investigated whether temporal information about harmful between-task interference, as measured by the BCE, can be utilized to implement control processes that shield T1 processing from T2 interference. In two experiments, foreperiods (FPs) of different lengths predicted with a high probability either an incompatible or compatible dual-task trial. We found that FPs can serve as contextual cue to modulate the BCE which was reflected in reduced BCEs when FPs predicted an incompatible trial. Thus, this finding provides evidence of context-specific task shielding in dual-tasking in the absence of exogenous cues. We suggest that control processes to implement task shielding can be optimized based on temporal expectancies of between-task interference. One idea of the underlying mechanism is that the degree of limited capacity to select a T1 response is adjusted based on these expectancies.

Response-response bindings are binary

Birte Moeller & Christian Frings
Trier University
moellerb@uni-trier.de

Many accounts of human action control assume bindings between stimuli and responses of individual events (e.g., Hommel, Müsseler, Aschersleben, & Prinz, 2001; Logan, 1988; Schmidt, De Houwer, & Rothermund, 2016). One widely accepted assumption about these bindings is that they do not contain temporal order representations regarding the integrated elements. Even though several theories either explicitly or implicitly include it, this assumption has never been tested directly. One reason for this lack of evidence is likely that typical stimulus-response binding paradigms are inapt for such a test. Adapting a new paradigm of response-response binding to include order switches between response integration and retrieval, we were able to analyze possible representation of order information in bindings. In the presented experiment (n = 30), binding effects were identical for intact and switched response orders, indicating that bindings indeed include no temporal order information. Implications for the role of binding in learning paradigms and for action control in general are discussed.

Object file binding of irrelevant auditory events: Evidence from the cross-modal oddball task

Malte Möller[1], Susanne Mayr[1] & Axel Buchner[2]
[1]University of Passau, Chair of Psychology and Human-Machine Interaction; [2]Heinrich-Heine University, Düsseldorf, Cognitive and Industrial Psychology
malte.moeller@uni-passau.de

Unexpected changes in an otherwise consistent environment are typically associated with behavioral costs in performance. The present study took advantage of this novelty distraction effect to investigate whether features of irrelevant auditory stimuli are bound into common representations, so-called object files. In a cross-modal oddball paradigm, participants performed odd/even judgements on visually-presented numbers while ignoring one of three task-irrelevant sounds presented from one of three loudspeakers. For each participant, two unique combinations between sound identity and speaker location were presented frequently (standards, p = .8) while the remaining combinations only occurred rarely (deviants, p = .2). Deviants systematically differed from the standards with respect to identity, location or both. The results showed impaired responding in deviant as compared with standard trials when deviants solely differed in one feature, i.e. either sound identity or location. However, no novelty distraction effect was obtained when deviants and standards differed in both features. This is well in line with the notion that spatial and identity features of task-irrelevant auditory events are bound into common representations, leading to time-consuming updating of the object file in the case of partial mismatches.

Learning novel object classes with very little data

Yaniv Morgenstern, Filipp Schmidt & Roland W. Fleming
Justus-Liebig-University Giessen
yaniv.morgenstern@gmail.com

One of our most remarkable visual abilities is the capacity to learn novel object classes from very little data. Given just a single novel object, we usually have certain intuitions about what other class members are likely to look like. Such 'one-shot learning' presumably leverages knowledge from previously learned objects, particularly: (1) by providing a feature space for representing shapes and their relationships and (2) by learning how classes are typically distributed in this space. To test this, we used crowdsourcing to obtain responses on unique shapes. On each trial, observers judged whether a target shape was in the same class as context shape(s). The results reveal that participants only perceive objects to belong to the same class when they differed from one another by a limited amount, confirming that observers have restricted generalization gradients around completely novel stimuli. The findings also reveal a surprisingly consistent distance around each base shape in the feature space, beyond which objects are deemed to belong to different classes. Thus, a model with one free parameter describing whether different objects in the same class tend to be from same or not predicts one-shot learning surprisingly well.

The anticipatory driving interval: the effect of cognitive load and cue characteristics

Kristin Muehl
Ulm University, Department Human Factors, Institute of Psychology and Education, Faculty of Engineering, Computer Science and Psychology
kristin.muehl@uni-ulm.de

Anticipatory driving enhances traffic safety and comfortable as well as energy-optimized locomotion. Based on the perception of characteristic cues prior knowledge is activated and anticipation is triggered. In order to get closer insights in the cognitive process of anticipation a laboratory experiment using video-based traffic scenarios was conducted (N = 42). Participants were asked to indicate from a driver's perspective the initial suspicion and the obvious anticipation of another car crossing the own lane. The cognitive demand (high vs. low) and the characteristics of cues were manipulated in a within-subjects design. Overall an effect of cognitive demand on anticipatory performance was found for initial suspicion, but not for obvious anticipation, supporting different processing of the anticipatory interval. Furthermore, multiple evident cues in comparison to single evident cues facilitate the anticipatory performance. These findings provide the basis for supporting the anticipatory process in dynamic driving situations.

Systematisierungsentwurf für fahrfremde Tätigkeiten bei hochautomatisierter Fahrt

Andreas Lars Mueller & Bettina Abendroth
Technische Universität Darmstadt Institute of Ergonomics & Human Factors
a.mueller@iad.tu-darmstadt.de

Das automatisierte Fahren ist kein Zukunftsszenario mehr und technisch bereits in gewissen Szenarien umsetzbar. Beim hochautomatisierten Fahren (SAE L3) kann sich der Fahrer gänzlich vom Fahrgeschehen abwenden und fahrfremde Tätigkeiten für einen gewissen Zeitraum ausführen. Jedoch hat auch ein hochautomatisiertes System seine Grenzen oder kann ausfallen. Unter diesen Umständen muss der Mensch in der Lage sein, die Fahraufgabe wieder vollständig zu übernehmen. In bereits veröffentlichten Forschungsarbeiten zur „Out-of-the-loop-Problematik" bei teil- und hochautomatisierter Fahrt zeigt sich, dass vor allem der Wechsel zurück zur manuellen Fahrt in kritischen als auch in unkritischen Situationen aus arbeitswissenschaftlicher Sicht besonders herausfordernd ist. Dabei wurden bereits unterschiedliche fahrfremde Tätigkeiten, wie beispielsweise der Surrogate Reference Task (SuRT), Interaktion mit Mobiltelefon oder das Lesen eines Magazins bei höher automatisierten Fahrzeugen erforscht. Da die Möglichkeiten von fahrfremde Tätigkeiten im hochautomatisierten Fahrzeug nahezu unbegrenzt erscheinen, werden diese in einem ganzheitlichen Betrachtungsansatz systematisiert. Für die weitere Erforschung der Fahraufgabenrückübernahme bei hochautomatisierter Fahrt, wird daher eine Priorisierung von fahrfremden Tätigkeiten durch Befragungen und CoverStory-Fahrsimulatorstudien bestimmt. Darauf aufbauend sollen verschiedene subjektive und psychophysiologische Kapazitätsmessmethoden angewandt werden (u.a. Blickbewegungsanalyse zur Bestimmung des kognitiven Workloads), um fahrfremden Tätigkeiten in Ausprägungsstufen zu quantifizieren und beschreiben zu können.

Face adaptation aftereffects on local information

Ronja Mueller[1], Sandra Utz[2], Claus-Christian Carbon[2] & Tilo Strobach[1]
[1]Medical School Hamburg, Department of Psychology; [2]University of Bamberg, Department of Psychology
ronja.mueller@medicalschool-hamburg.de

Previously inspected faces can affect the perception of faces seen subsequently. The underlying mechanisms of these face adaptation aftereffects (FAAE) have been considered to be based on sensory adaptation. More recent studies however suggest also an adaptation on a representational basis. Thus, FAAEs are a useful medium to investigate the dynamics and mechanisms of more complex cognition and also of cognitive plasticity. Although research on adaptation effects in faces seems to be well-advanced, the specific mechanisms that underlie those effects are still not completely understood. Research especially lacks a systematic analysis of the robustness and transferability of the measured effects as well as the involvement of other cognitive conditions such as rigidity. Furthermore, previous experiments on FAAEs did not yet consider all types of face information, i.e. they focused primarily on the investigation of adaptation effects on spatial information. Adaptation effects on local information however are barely investigated. The present paper considers open issues regarding FAAE-research, develops a research agenda and specifically addresses the processing and representation of local face information.

Voice identity perception ability is linked to contrastive aftereffect size

Constanze Mühl & Patricia E.G. Bestelmeyer
Bangor University, School of Psychology
psp670@bangor.ac.uk

There are remarkable individual differences in the ability to differentiate and recognise individuals by their voice. Here we were interested whether this individual variability in skill, both at the high and low-level of audition, is linked to adaptive coding of voice identity. In two experiments we explored first, whether the aftereffect size to two familiar vocal identities can be explained by voice perception ability and second, whether this effect stems from low-level auditory skill (such as pitch discrimination ability). In the first experiment, we found that contrastive aftereffect sizes for voice identity were linked to voice perception ability. In the second experiment, we replicated this finding and also demonstrated that this effect is not related to more low-level auditory abilities. In addition, aftereffect sizes in voice identity and a control adaptation condition (adaptation to musical harmony) did not correlate. Our results highlight the important functional role of adaptive voice coding mechanisms in voice perception expertise and suggest that human voice perception is a highly specialised and distinct auditory ability.

Goalkeepers' Reputation Biases Penalty-Kicking Behavior in Soccer

Florian Müller, Jonathan Felix Best & Rouwen Cañal-Bruland
Friedrich Schiller University Jena, Department of Sport Psychology
florian.mueller@uni-jena.de

Penalty-takers in soccer adjust their kicking behavior in response to even slight changes in goalkeepers' position or height. However, height estimates of observed individuals are fragile and subject to bias. In fact, evidence suggests that goalkeepers with high reputation are judged to be taller compared to low reputation keepers. Here we examined whether both height and reputation would affect actual kicking behavior in penalties. Penalty-takers faced goalkeepers of different height (tall vs. small) and reputation (high vs. low) projected on a life-size screen. They estimated goalkeepers' height and took actual penalties. First, both height and reputation influenced height estimates. Tall keepers were judged taller than small keepers. Similarly, high reputation keepers were judged to be taller as low reputation keepers. Most importantly though, reputation also influenced kicking behavior. When facing a goalkeeper with a high reputation penalty-takers aimed further away from the goalkeeper (i.e. kicked closer to the posts) and even missed the goal more often. Our findings demonstrate that reputation affects height estimates of a goalkeeper, but perhaps more importantly changes actual shooting behaviors.

Haptic feedback improves number magnitude estimation

Jennifer Müller[1], Uwe Oestermeier[2], Korbinian Moeller[3] & Peter Gerjets[4]
[1]Eberhard Karls University of Tübingen, LEAD Graduate School & Research Network; [2]Leibniz-Institut für Wissensmedien, Software Development Department; [3]Leibniz-Institut für Wissensmedien, Neuro-cognitive Plasticity Lab; [4]Leibniz-Institut für Wissensmedien, Multimodal Interaction Lab
jennifer.mueller@lead.uni-tuebingen.de

Can manual exploration of objects facilitate learning of the abstract concept of numerical magnitude by different types of haptic feedback? The present study examined the influence of haptic feedback on bodily representations of number magnitude. 59 adult participants were asked to indicate the magnitude of numbers 1 to 10 by adjusting the distance between their thumb and index finger. Afterwards participants had to sort wooden rods of different physical lengths representing the respective numbers in an embodied training. Half of the participants were instructed to grasp the rods lengthwise between thumb and index finger. Thereby, they received haptic feedback about the length of the respective number rods, meaning wider grip aperture for larger numbers. The other half grasped the rods widthwise, and thus, they got no haptic feedback about the length of the respective number-rods. As expected, participants who received haptic feedback of number magnitude by grasping rods lengthwise during training performed significantly better than the widthwise grasping group, when asked to indicate the magnitudes of numbers 1 to 10 as the distance between fingers again. These results suggest that haptic feedback of physical magnitudes facilitates an internal scaling of number magnitudes corroborating the notion of embodied numerosity.

Forget the fairy tale of accuracy-effort trade-offs: mental models and availability of internal information determine heuristic application

Jörg Müller
Justus Liebig University, Institute of Agribusiness Management and Food Economics
joerg.mueller@agrar.uni-giessen.de

In past decades, various heuristic strategies have been described theoretically and proven empirically. However, there is still only limited knowledge about underlying reasons for their application in specific situations. Effort accuracy trade-off is one commonly explanatory approach. This study examines additional factors for the application of heuristic strategies in familiar decision situations. This was done by an incentivized lab experiment with information search tracking: 145 real decision makers (operative managers) had to solve seven familiar inference tasks with real alternatives. The presented information about alternatives (18 attributes and brand name) can be used in three kinds of decision strategies: (1) Memory-based: brand names can be used to recall alternatives' past performance. (2) Model-based: inferences about performance based on mental models using information about single attribute values. (3) Combinations of these strategies. In most cases (82.7%) combined strategies are observed, while memory-based (6.3%) and model-based strategies (11.0%) are more rarely applied. Decision effort and strategy selection are independent of decision magnitude. However, task variations and availability of internal information (experience with alternatives) result in different decision effort. These results indicate that instead of effort accuracy trade-offs, mental models and availability of internal information determine the application of heuristic strategies

Differential emotion-induced effects on the efficiency of cognitive control throughout adolescent development

Lena Müller, Hannah Ritter & Jutta Kray
Saarland University, Department of Psychology
lenamuller5@aol.com

Developmental theories assume that mid-adolescents are less able to down-regulate their emotions, due to an early maturation of the socio-emotional system but later maturation of the cognitive control system during adolescence. To investigate this, we examined the ability to withhold and initiate responding in the presence of different emotional contents. We applied an Emotional Go-Nogo Task in which participants were either to respond (Go) or to not respond (Nogo) to neutral, happy, and angry faces. We measured false alarm rates (FA; responding on Nogo trials) as index of response inhibition and hit rates (Hits) as index of response initiation and compared them between children (9-11 years), mid-adolescents (12-14 years) and late-adolescents (15-18 years). We found a decrease of FA and an increase of Hits with increasing age, in line with age-related improvements in cognitive control. While children's FA were not sensitive to emotional contents, mid-adolescents showed higher FA for emotional than for neutral faces, irrespective of their valence, and late-adolescents only produced higher FA for angry faces, indicating an increased differentiation of processing emotional contents throughout development. All age groups showed higher Hits for happy than angry stimuli, suggesting that positive emotions can foster response initiation early in development.

Does task asymmetry determine the influence of anticipated partner reactions on task set selection?

Romy Müller, Elisabeth Wienß & Hanna Bärwinkel
TU Dresden, Professur Ingenieurpsychologie und angewandte Kognitionsforschung
romy.mueller@tu-dresden.de

Contingent partner reactions influence actions control. Previous studies on task set selection suggest that such influences depend on relative task strength: While a standard compatibility benefit emerges in the stronger one of two conflicting tasks, it is absent or reverses in the weaker. However, previous studies manipulated asymmetry between qualitatively different tasks rather than systematically varying it within one task type. Therefore, in two experiments subjects had to select between two tasks of the same type (i.e., selection of a green vs. purple sudden onset among grey distractors). In Experiment 1, there was no asymmetry as the targets for both tasks were similarly salient, while in Experiment 2 asymmetry resulted from one target being more salient than the other. After each reaction a partner responded compatibly or incompatibly. Without task asymmetry, compatible reactions speeded up performance and reduced fixations to distractors in both tasks. For asymmetric tasks, we did observe the expected pattern, with only the stronger task producing compatibility benefits. However, the interaction was not significant. The results suggest that some asymmetry is insufficient to produce differential compatibility effects. However, it remains to be investigated whether asymmetry needs to be stronger or tasks need to be qualitatively different.

Interactions of approximate number processing skills with numeracy and executive functions in decision making under risk

Silke M. Müller[1], Margarete Delazer[2] & Matthias Brand[3]
[1]Universität Duisburg-Essen, General Psychology: Cognition; [2]Clinical Department of Neurology, Innsbruck Medical University; [3]General Psychology: Cognition and Center for Behavioral Addiction Research (CeBAR), University of Duisburg-Essen, Duisburg Erwin L. Hahn Institute for Magnetic Resonance Imaging
silke.m.mueller@uni-due.de

Research aim: Research has shown that different numerical skills influence decision making (e.g. Peters & Bjalkebring, 2015). It has been shown that high normative numerical skills (numeracy) compensate for the negative impact of weak executive functions on decision making under risk. The current study investigates compensatory effects of further, more basal, numerical skills, namely approximate number processing. Methods: Two groups of participants (n=64 each) performed either the Game of Dice Task (GDT) or the GDT-Double, which places more emphasis on probability processing in decisions under risk. Additionally, both groups performed a dot-comparison task assessing approximate number processing, the Modified Card Sorting Test (MCST) measuring executive functions, and a numeracy task. Results: Performance in the MCST and the dot-comparison task significantly interacted in predicting GDT performance in both groups, with higher effect size in the original GDT. There was no three-way interaction with 'group'. Overall, however, the three predictors 'executive functions', 'numeracy', and 'approximate number processing' all interacted, in a way that especially those individuals with deficits in all three competencies made significantly more risky choices. Discussion: The results indicate that approximate number processing skills may compensate for decision-making deficits due to lack of normative numerical skills or weak executive functions.

Seeing the world through the eyes of an avatar

Jochen Müsseler & Christian Böffel
RWTH Aachen University, Work and Cognitive Psychology
muesseler@psych.rwth-aachen.de

In virtual environments, we often interact with avatars and take the world from their perspective. The present experiments examine a situation, in which an actor observes and controls an avatar from different spatial perspectives. The avatar was presented in top view on a display and its perspective was varied by different angles of rotation relative to the actor. In this case, the spatial stimulus-response relationships from the avatar's perspective could deviate from the actor's perspective. Therefore, compatibility tasks were introduced to determine which stimulus-response relationship determines compatibility, the perspective of the avatar or the perspective of the actor. The results showed that stimulus-response compatibility went with the avatar (and not with the actor), when the stimulus position is necessary to complete the task at hand. Further, compatibility went even with the avatar, when stimulus position is irrelevant for the task (Simon effect) — but only if certain conditions are met.

"Sad, thus true" or "too good to be true"? Separating negativity and positivity biases in judgments of truth

Lena Nadarevic
Universität Mannheim
nadarevic@psychologie.uni-mannheim.de

The statement "80% of marriages last ten years or longer" carries the same meaning as the statement "20% of marriages get divorced within the first ten years". Nevertheless, the two statements differ in one important way: The first statement is framed positively whereas the latter one is framed negatively. Several studies have found higher truth judgments for negatively compared to positively framed statements. However, it is unclear if negative framing increases perceived truth (negativity bias), if positive framing decreases perceived truth (positivity bias), or if both effects contribute to the framing effect. To answer this question, the current experiment used statements that contained both frames as a baseline condition (e.g., 80% of marriages last ten years or longer and 20% of marriages get divorced within the first ten years). Compared to this baseline condition, truth judgments were higher in a negative frame condition and lower in a positive frame condition. However, the negative framing effect was much larger than the positive one. Hence, negativity as well as positivity biases contribute to the framing effect on judgments of truth, albeit to different degrees.

Working Memory Capacity Facilitates the Generation of Free Choices

Christoph Naefgen & Markus Janczyk
Tübingen University, Cognition and Action
christoph.naefgen@uni-tuebingen.de

Free choice tasks are tasks in which two or more equally valid response options per stimulus exist. In investigations of the putative difference between voluntary and stimulus-determined actions, they are often contrasted with forced choice tasks, in which only one response option is considered correct. Repeatedly, responses in free choice tasks have been demonstrated to be slower compared to forced choice task responses, and it was suggested that free choice tasks are in fact random generation tasks. Here, we tested the prediction that in this case randomness should suffer under increased working memory (WM) load with two complementary free choice experiments. In Experiment 1, participants were provided with varying levels of external WM support in the form of displayed previous choices, and in Experiment 2, WM load was induced via a concurrent n-back task. In general the data confirm the prediction: In Experiment 1, WM support improved both speed and randomness of responses. In Experiment 2, responses slowed down with increasing WM load and randomness decreased as well. These result help to pinpoint potential differences between free and forced choice tasks.

Effects of motor imagery on postural control in quiet stance

Tim Naumann, Adam Zabicki, Johannes Kurz & Jörn Munzert
Justus-Liebig-University, Department of Sports Science
tim.naumann@sport.uni-giessen.de

According to the Simulation Theory by Jeannerod (2001), the imagination and the execution of an action share the same neural substrates. Furthermore, recent studies showed that imagining oneself executing a fast reaction task with different loads, leads to specific modulation of postural control (Boulton & Mitra, 2015). The aim of this study was to examine whether for an imagined continuous movement, specific characteristics like load, speed or amplitude lead to specific adaptations in postural control. 16 participants (12 female, age: 25 ±4.08 years) imagined or executed repetitive shoulder abduction movements while standing in tandem position. The movements varied in load that had to be lifted (0, 1.5 or 3 kg), speed (1.5, 2.25 or 3 s/movement cycle) and amplitude (30°, 60° or 90°). Body sway as a measure for postural control was recorded with a force plate (AMTI, Watertown, MA). Results showed that the sway increased significantly when participants executed movements with higher load, speed or amplitude. In motor imagery conditions, none of these effects could be found. One possible explanation could be that demands on postural control in repetitive movements are lower compared to fast reaction tasks that were used in previous studies.

The first sight does not matter: Gender as the first cue on job applications

Nadine Nett, Tillmann Nett, Robert Gaschler & Andreas Glöckner
FernUniversität in Hagen, Institut für Psychologie
nadine.nett@fernuni-hagen.de

One of the first pieces of information an employer receives of a job applicant is their gender. There is substantial evidence that the gender of an applicant biases the decision to hire them. Currently gender biases in hiring are mainly studied by sending CVs and application forms to potential employers or consultants. In previous research we attempted to replicate the current findings in a laboratory setting by having participants decide for one of two applicants based on expert recommendations. Contrary to results from hiring studies, no effect of gender could be found. Therefore, in a pre-registered experiment (N=109) we attempted to identify the cause for our failure to conceptually replicate the existing studies. In the novel experiment we added a manipulation, in which we presented the irrelevant gender information by itself before showing any valid cues to some of the participants. In addition we adapted our analysis by performing individual strategy identification for all participants using a Bayesian framework. As in our previous study, however, no influence of the gender information could be found for either group of the participants. Instead we found that the participants followed a rational strategy selecting the applicant which was objectively better.

Theoretical and Empirical Comparison of Parallel Constraint Satisfaction and Leaky Accumulator Models

Tillmann Nett & Andreas Glöckner
FernUniversität in Hagen, Institut für Psychologie
tillmann.nett@fernuni-hagen.de

The parallel constraint satisfaction (PCS) model is a neural network frequently used in research on decision making. According to this model, information is integrated based on the principle of coherency. Therefore, this model can predict not only the decision, confidence judgments, and response times but also coherence shifts in which the validities of the cues are re-evaluated during the decision process. In research on perceptual choice and in machine learning, however, leaky accumulator or leaky integrator (LI) networks are more common. We compare these two networks mathematically, and show that both types of networks can be understood as instances of a more general class of networks, which we call Adaptive Memory Leaky Integrator (AMeLI) networks. Through this analysis, we show that the commonalities of all instances of this class go beyond superficial similarities of the governing equations, but rather that all instances are driven by the same underlying principles. Therefore, LI and PCS must make very similar predictions in most cases and research on LI networks may also be applied to PCS and vice versa. Finally, we show that the additional complexity of PCS vs. LI networks is required to fit data from experiments on decision making.

Brighter is not always better: High salience can slow responses to warning signals

Christiane R. Neubert[1], Wolfgang Einhäuser[2], Sabine Grimm[3] & Alexandra Bendixen[1]
[1]Chemnitz University of Technology, Institute of Physics - Cognitive Systems Lab; [2]Chemnitz University of Technology, Institute of Physics - Physics of Cognition Group; [3]Leipzig University, Institute of Psychology - Cognitive and Biological Psychology; Chemnitz University of Technology, Institute of Physics - Cognitive Systems Lab
wolfgang.einhaeuser-treyer@physik.tu-chemnitz.de

It seems widely accepted that warning signals should be maximally salient. Yet, though highly salient signals might be efficient in capturing attention, they might distract from task execution. To test this hypothesis, we combined a visual primary task with visual and auditory warning signals. Participants reported the location of a small gap in sequentially presented central squares. Occasionally, this primary-task stimulus was accompanied by a peripheral "alert square". The alert square was surrounded by a frame and coincided with a congruently lateralized tone. Participants had to report the location of the gap in the alert square before proceeding with the primary task. When the frame's contrast or the tone's intensity were increased, participants directed their gaze to the alert square more quickly. Increasing tone intensity yielded quicker responses to the alert square and to the subsequent primary task. Increasing the frame's contrast did not yield a similar benefit, as it increased the time from fixating the alert square to responding. Further experiments revealed that the balance between gaze and response time critically depended on the frame's presentation duration. In conclusion, too high visual salience can interfere with task performance and nullify more efficient attentional guidance towards the warning signal.

The effect of event photographs on second-language learning of Vietnamese collocations

Huong Thi Thu Nguyen, Katja Münster, Carsten Schliewe & Pia Knoeferle
Humboldt University of Berlin, Department of German Language and Linguistics
nguyetxh@hu-berlin.de

We investigated whether event photographs can facilitate Vietnamese verb-noun collocation learning in adult German second language learners. We manipulated two independent factors: visual context (presence vs absence of event photographs) and language context (1:1 vs. 1:many verb-noun mappings). In Experiment 1 (N=32), participants saw the same object pictures in training and testing. At testing, they completed a spoken verb by selecting a noun referent (an object photograph). In Experiment 2, a further 32 participants heard the full verb-noun collocation and selected the matching one of two event photographs; event pictures differed between training and testing, rendering the learning task arguably more difficult. While the analyses failed to corroborate an effect of event photographs in either participants' accuracy or their reaction times in Experiment 1, reliable effects of event presence emerged in Experiment 2: Participants were significantly more accurate and faster in identifying the collocation by selecting the correct event photograph when they had (vs. had not) seen supportive events during learning. The main effect of language context and the interaction between verb-noun mappings and event photograph presence was non-significant in both experiments. Thus, event photographs can facilitate second language learning but only in a suitable learning and testing context.

Expectancy for social participation: ERP correlates of a recalibration process

Michael Niedeggen[1] & Kerschreiter Rudolf[2]
[1]FU Berlin, Experimental Psychology and Neuropsychology; [2]FU Berlin, Social, Organizational and Economic Psychology
michael.niedeggen@fu-berlin.de

Previous event-related brain potential (ERP) studies indicated that the threat of social needs elicited in a cyberball paradigm is determined by the deviation between expected and perceived participation - as reflected by the P3 amplitude. Expectancy, however, is not a set point, but might be adjusted within an experimental run. Re-analyzing two independent data sets (Weschke & Niedeggen, 2015; Niedeggen et al., 2014), we aimed to test this hypothesis: In the first study (n=15), an inclusionary experimental block (ball reception 33%, two co-players) was followed by a partial-exclusion block (16%). In the second study (n=20), an inclusionary block (33%) was followed by overinclusion (46%). For both data sets, a split-half analysis revealed a significant reduction of the P3 amplitude within each block. If the P3 responses registered in the first half of each block were related to the participants' questionnaire reports, significant correlations can neither be found for a transition to partial exclusion (r=.19), nor for a transition to overinclusion (r=-.11). In contrast, the corresponding correlations were significantly expressed for the P3 amplitudes based on the second half of each run (r=.56, and r=.53). We suppose that the recalibration of expectation contributes to differences in the sensitivity to exclusion.

Sleep strengthens integration of spatial memory systems

Hannes Noack[1], Christian F. Doeller[2] & Jan Born[3]
[1]University Tübingen, Medical School Department of Psychiatry; [2]Trondheim University Hospital, Kavli Institute for Systems Neuroscience; [3]University Tübingen, Institute for Medical Psychology and Behavioral Neurobiology
hannes.noack@uni-tuebingen.de

Spatial memory comprises different representational systems that are sensitive to different environmental cues like proximal landmarks or local boundaries. While sleep supports systems memory consolidation, its effects on spatial memory representations are unclear. Here we examined how sleep affects landmark-referenced and boundary-referenced spatial representations and their integration. In the main study, participants (n=42) were familiarized with an environment featuring both a proximal landmark and a local boundary, before nocturnal sleep or wake periods. After another night of sleep, participant's capability to integrate spatial cues was tested: To this end, participants learned new object locations within the familiar environment with only the landmark or the boundary present. At retrieval, spatial cues were exchanged, such that boundary referenced objects had to be retrieved relative to the landmark and vice-versa. Results indicate a distinctly increased flexibility in using either landmarks or boundaries for navigation, when familiarization to the environment was followed by sleep than wakefulness. A second control study (n = 45) did not reveal effects of sleep (versus wakefulness) on navigation in environments featuring only landmarks or only boundaries. Thus, rather than strengthening isolated representational systems per se, sleep presumably through forming an integrative representation, enhances flexible coordination within representational systems.

Cognitive control in multimodal attention shifting - Electrophysiological and behavioral evidence

Sophie Nolden, Sophia von Salm & Iring Koch
RWTH Aachen University, Cognitive and Experimental Psychology
nolden@psych.rwth-aachen.de

We investigated behavioral and electrophysiological correlates of cognitive control in multimodal attention shifting. Participants were presented a bimodal target stimulus comprising a tone and a visually presented circle. Both the tone and the circle could either be clear or noisy, and this was varied independently in the auditory and visual modality. The bimodal target stimulus could thus be congruent, i.e., when both the tone and the circle were either clear or noisy, or incongruent, i.e., when the tone was clear and the circle was noisy or vice versa. Participants had to attend to only one sensory modality and perform a clear/noisy classification task. The relevant modality of each trial was indicated by a preceding letter cue, so that the relevant modality repeated or switched randomly from trial to trial. Performance was impaired when participants switched between sensory modalities. In addition, crossmodal congruency effects were sequentially modulated, but only when the relevant modality repeated. This finding was mirrored in the electrophysiological data. The study thus suggests that modality shifting leads to a shift in the episodic context and thus to an attentional reset.

Bridging the gap between science and practice – Affect Misattribution Procedure as ecological and easy to manage tool to measure implicit brand attitudes

Mandy Nuszbaum & Tanja Krause
FOM University of Applied Sciences, Business Psychology
mandy.nuszbaum@fom.de

Consumer behavior is not only determined by explicit thoughts and attitudes. Even though, a couple of studies show promising effects using implicit measures within consumer research, they have not been employed as standard in practice. Within three studies, the Affect Misattribution Procedure (AMP; Payne, Cheng, Govorun, & Stewart, 2005) has been explored as an ecological and easy to manage tool measuring brand attitudes. In study 1, we used positive vs. negative brand logos as primes and neutral Chinese characters as targets. As expected, brand attitude was misattributed toward neutral Chinese characters and led to significant more positive evaluations after exposure to positive vs. negative primes. In study 2, we used the same primes as in study 1. As targets, neutral barcodes were employed, which are closer to consumer context. Again, misattribution toward neutral barcodes could be observed in the expected direction. In study 3, we used positive brand names/brand concepts vs. nonwords as primes. Barcodes were used as targets. The results showed, more positive evaluations following positive brand-concept primes compared to the no brand-concept primes. In sum, AMP seems to be a promising tool and easy to use for market researchers, which might be employed for different materials.

Validierung der Driving Anger Scale (DAS) für deutsche Autofahrer

Michael Oehl[1] & Stefan Brandenburg[2]
[1]Leuphana Universität Lüneburg; [2]Technische Universität Berlin
oehl@uni.leuphana.de

Driving Anger ist assoziiert mit aggressivem, unangepasstem Fahrverhalten sowie mit einem höheren Risiko von Verkehrsunfällen. Daher ist Driving Anger ein breit untersuchtes Konzept von verkehrspsychologischer Relevanz. Zahlreiche Studien in unterschiedlichen Ländern um die ganze Erde herum haben Driving Anger und das dazu meist verwendete Messinstrument, die Driving Anger Scale (DAS; Deffenbacher et al., 1994), überprüft. Dabei zeigten sich oft kulturelle Unterschiede, so dass beispielsweise einzelne Items oder ganze Subskalen der Driving Anger Scale entfernt oder modifiziert werden mussten, um eine kulturspezifische Validierung zu gewährleisten. Eine aktuelle, breite Validierung der Driving Anger Scale für deutsche Autofahrer fehlt bisher. Brandenburg et al. (2017) führten eine Validierung für deutsche Taxifahrer durch, die zeigte, dass die Driving Anger Scale für diese Gruppe der Autofahrer in Deutschland angepasst werden muss. In der aktuell vorliegenden Studie wird eine Validierung der Driving Anger Scale für normale Autofahrer (N = 1136) durchgeführt. Die Probanden füllten die Driving Anger Scale (Deffenbacher et al., 1994) sowie zur Überprüfung der Konstruktvalidität die deutsche Version des State-Trait-Ärgerausdrucks-Inventars (STAXI; Schwenkmezger et al., 1992) aus. Eine konfirmatorische Faktorenanalyse ergab eine akzeptable Modellpassung der Driving Anger Scale mit ihren 33 Items in sechs Subskalen für die deutschen Daten. Implikationen werden diskutiert.

Investigating the relationship between confidence and manual movement during decision making

Denis O'Hora[1], Arkady Zgonnikov[2], Aisling Kenny[1] & Kongfatt Wong-Lin[3]
[1]National University of Ireland, Galway School of Psychology; [2]University of Aizu, Complex Systems Modeling Laboratory; [3]Ulster University School of Computing, Engineering & Intelligent Systems
denis.ohora@nuigalway.ie

Making a decision requires us to evaluate a number of options and act to obtain the result we prefer. It is well established that, if evaluation processes persist during movement, the relative valence of available decision options influences decision movement; greater differences in valence induce faster, shorter and less complex responses. It is also well known that greater disparity in option valence induces greater post-decision confidence. Nevertheless, the relationship between decision movement and confidence remains relatively unexamined. In the current study, twenty-eight participants viewed noisy visual stimuli (random dot kinematograms) and reported the dominant direction of the stimuli using a computer mouse. Coherence (stimulus intensity) of the stimulus was experimentally manipulated across four levels. On completion of each response, participants gambled a number of points from 10 to 50; if they were correct, they gained the points and if they were incorrect, they lost the points. Mouse trajectory information was not predictive of post-decision certainty, but was strongly related to decision accuracy. Expected relationships among stimulus quality, decision accuracy, response time and confidence were also observed. The findings support an interpretation of decision confidence as dependent on evidence evaluation processes that continue to operate after a decision.

Rule-based strategies and integration of cues in unsupervised judgement

Tjasa Omerzu[1], Maarten Speekenbrink[2] & Janina Anna Hoffmann[3]
[1]University of Konstanz, Graduate School of Decision Sciences; [2]University College London, Department of Experimental Psychology, Division of Psychology and Language Sciences; [3]University of Konstanz, Department of Psychology
tjasa.omerzu@uni-konstanz.de

Everyday judgments, such as judging the attractiveness of a new acquaintance, often require integrating several pieces of information, without providing an objectively correct answer or getting feedback. Although these unsupervised judgments are an essential part of daily life, judgment research has neglected which cues people consider in those situations and how they integrate this information. Categorization research suggests that people only consider a single cue in the absence of feedback - predominantly the most variable one. The present study aims to investigate on which cues people base their judgments in judgment tasks without feedback and to what degree people jointly consider several pieces of information. Particularly, we investigate if people preferably consider cues providing highly variable information or cues conveying more information. Second, we investigate to what degree people only rely on one cue or integrate information from several cues. To test those predictions, participants repeatedly judge abstract stimuli consisting of three cues. In this initial judgment phase, we systematically single out one cue that differs from the two others either in variance or informativeness. A final decision stage then allows to discriminate across conditions which information people primarily base their judgments on in unsupervised judgment.

Instruction manipulations during dual-memory retrieval practice: Can they eliminate a retrieval stage processing bottleneck?

Franziska Orscheschek[1], Timothy Rickard[2], Torsten Schubert[3] & Tilo Strobach[1]
[1]Medical School Hamburg, Department of Psychology; [2]University of California San Diego, Department of Psychology; [3]Martin-Luther Universität Halle-Wittenberg, Department of Psychology
franziska.orscheschek@medicalschool-hamburg.de

The study investigated the role of instruction manipulations and the associated cognitive architecture of learned retrieval parallelism in the context of dual-memory retrieval from a single cue. So far, dual-memory retrieval research in this context focused on response strategies that subjects naturally adapted during practice. Results of these studies indicated the presence of learned retrieval parallelism for a subset of subjects that exhibited a synchronized response strategy. This form of retrieval parallelism is cue-specific, consistent with the set-cue retrieval bottleneck model. To extend these findings, subjects in the present study were instructed by the experimenter to apply a synchronized response strategy across three sessions of dual-memory retrieval practice with one set of cues (old cues). Following this practice on old cues, the cue-specificity of potential learned parallelism was investigated with the presentation of another set of new dual-retrieval cues. Preliminary results indicate the possibility to instruct learned parallelism and to influence the efficiency of dual-memory retrieval. Further results specify the dual-memory retrieval bottleneck with respect to the set-cue bottleneck model in the context of instructed learned parallelism.

Coping with kitsch: Aesthetic appreciation and the dynamics of social motivation

Stefan Andreas Ortlieb & Claus-Christian Carbon
Lehrstuhl für Allgemeine Psychologie und Methodenlehre der Universität Bamberg
stefan.ortlieb@uni-bamberg.de

In 20th century art criticism the term "kitsch" has been frequently used to contrast "high art" (Greenberg, 1939). This distinction raises an interesting question: If kitsch is considered aesthetically worthless why is it so tremendously popular? Norman (2004) claims that we value keepsakes mainly because they cheer us up on a rainy day. Does kitsch actually help people to cope with uncertainty and negative emotions? If this is the case, appreciation of kitsch should be dynamically related to feelings of security and self-determination: Whenever people feel vulnerable and dependent, they should become more susceptible to its familiar, clear-cut, benign, and therefore reassuring qualities. Based on these considerations we present a functional model which relates preferences for familiarity (or novelty respectively), determinacy (ambiguity) and fluent processing (cognitive mastery) to two basic needs of social motivation (Bischof, 1989): security and arousal. Besides, results of an experimental study are presented which show that decorative objects are rated less kitschy after in sensu exposure to existential threats. Our model also allows for an integration of other recent findings on art perception and design evaluation. Finally, it opens an entirely new research perspective for empirical aesthetics by taking phenomena of popular aesthetics into consideration.

Structural similarities between response categories and response layout facilitate processing of overlapping categories

Anton Öttl[1], Dawn Marie Behne[1], Martine Aune[1], Pascal Gygax[2] & Ute Gabriel[1]
[1]Norwegian University of Science and Technology, Department of Psychology; [2]University of Fribourg, Department of Psychology
anton.oettl@ntnu.no

For a series of experiments in which response times were measured in parallel for three partially overlapping response categories (i.e., male, female and mixed faces), we designed a task in which response buttons were laid out analogously to the response categories: whereas the categories male and female were associated with unimanual responses, the mixed category was associated with a bimanual response, mirroring the composite nature of this category. The present study investigates how this approach to designing a response layout affects the processing of corresponding response categories by replicating the experiment with a non-analogue sequential design in which the three response alternatives were associated with three different fingers. To isolate motoric aspects from other aspects of processing, both experiments contained baselines in which the task was merely to press the relevant buttons as quickly as possible. Results suggest that from a purely motoric point of view, a sequential design is easier to deal with, as response times were fastest in this baseline. For the categorization task however, the sequential design had the slowest response times, indicating that an analogue layout facilitates processing. These findings highlight the importance of considering the structural correspondence between response categories and response layout.

Training improves recall precision for colours of novel objects

Rebecca Ovalle Fresa & Nicolas Rothen
University of Bern, Institute of Psychology
rebecca.ovalle@psy.unibe.ch

Training can enhance higher cognitive functions (e.g., memory). Due to binary response paradigms, enhancements are almost exclusively observed on quantitative levels (e.g., probability of successful recall from memory). However, it remains to be elucidated if training can also result in qualitative enhancements (e.g., precision of recalled memory representations). Using an object-color association task and a mixture modeling approach to estimate recall precision and recall probability, we investigated if training can enhance color representations in visual long-term memory (VLTM). Over the course of several training sessions, participants learnt specific object-color associations. Thereafter, participants' recall abilities were tested for novel object-color associations. Recall precision and probability improved for the specific object-color associations over the course of the training. Crucially, enhanced recall precision and probability were also observed for novel object-color associations after the training. A control group confirmed that the effect was due to training and not due to test repetition. We conclude that cognitive training can also improve qualitative aspects of human cognition.

The resolution of complex anaphors

Till Pachalli, Jessica Strozyk, Carolin Dudschig & Barbara Kaup
University of Tübingen, Department of Psychology
till.pachalli@uni-tuebingen.de

Complex anaphors are nominal expressions which are coreferential with propositionally structured antecedents, such as events. Referents of nominal expressions are represented as tokens in mental discourse models. The phenomenon of complex anaphors thus raises the question whether an event that is referred to by a propositional expression is immediately represented by means of a complex token in the mental model, or alternatively whether such a reification process takes place only if a complex anaphor is processed. As establishing new mental tokens is known to be costly, reading times of sentences with complex anaphors can give indication of the time point at which the reification of events takes place. We composed small texts consisting of an introductory sentence, a sentence referring to a target event, and a sentence with a coreferential complex anaphor. Depending on the version, the introductory sentence either did or did not include a cataphoric expression forcing the reification process to take place before the complex anaphor is being read in the final sentence. Reading times of the final sentences were indeed shorter in the former compared to the latter case, indicating that the reification of events takes place only when needed.

Paved with Gut Intuitions? Dissecting Differences between Intuitive and Deliberate Decision Makers in Complex Risky Decisions

Thorsten Pachur[1], Helen Steingroever[2] & Michael M. Lee[3]
[1]Max Planck Institute for Human Development; [2]University of Amsterdam; [3]University of Irvine
pachur@mpib-berlin.mpg.de

Previous studies have found that a person's decision style (i.e., intuitive, affective vs. deliberate, planned), identified via self-report measures, can be associated with differences in performance in some decision tasks. Here we investigate whether differences in decision style are associated with differences in behavior on the Iowa Gambling Task (IGT), one of the most popular experimental paradigms to study complex risky decision making. It has been suggested that intuitive, affective processes play a key role in the IGT, and intuitive decision makers might thus perform differently than deliberate decision makers. Participants completed the IGT as well as an extensive self-report decision-style inventory. Using an ensemble of Bayesian methods—encompassing Bayesian ANOVA, hierarchical Bayesian modeling with the prospect valence delta (PVL) model, and latent-mixture analyses—we found only minor differences between intuitive and deliberate decision makers on the IGT. The PVL model analyses suggested that the cognitive processes when completing the IGT are rather similar between the decision-style groups. Group classifications with latent-mixture analyses of participants' behavior on the IGT did not recover the intuitive vs. deliberate groups. Our results suggest that measures of decision style might be rather unrelated to how people behave in experimental decision tasks.

The development and validation of an academic self-forgiveness scale

Shama Padke & Raven Rinas
Ludwig-Maximilians-Universitaet, Psychology
S.Padke@campus.lmu.de

Self-forgiveness can contribute to positive well-being (Hall & Finchman, 2005), however few empirical studies have examined this phenomenon, particularly within the academic domain. This study reports the development of a self-assessment instrument designed to measure academic self-forgiveness, providing preliminary grounds for the importance of assessing self-forgiveness in students. The scale was developed through modification of the Heartland Forgiveness Scale (HFS; Thompson et al., 2005) including only self-forgiveness items specific to the academic domain. The scale was administered to a sample of university students, alongside measures of general forgiveness, academic self-concept and perceived stress. Exploratory factor analysis and item analyses were used to confirm construct unidimensionality, and evaluate indices of item difficulty, item discrimination, and scale reliability, respectively. In parallel to ASC theory (Marsh, 1990), it is hypothesized that self-forgiveness is domain-specific, and positively correlates with ASC, establishing convergent validity. Individuals with a higher propensity to self-forgive are expected to score lower on measures of stress, establishing divergent validity. Given that ASC is a strong predictor of academic achievement, this scale may serve as a diagnostic tool in educational settings to target students who may benefit from self-forgiveness interventions as a means to promote academic well-being.

Measuring potency in words with the semantic differential

Marina Palazova[1], Birgit Stürmer[1] & Annekathrin Schacht[2]
[1]International Psychoanalytic University Berlin; [2]Georg-August-Universität Göttingen
marina.palazova@ipu-berlin.de

Dimensional models of affect emphasize the dimensions of valence and arousal. Shortly, the third dimension of affect - potency, that is whether a stimulus is experienced as powerful or not - is gaining attention. Explanatory significance of potency may be high because it may differentiate between affective states that are similar on the other two dimensions (e.g. anger and fear, both highly negative and arousing), but imply contrary behavior tendencies (fight versus flight, respectively). Until now, instruments for measuring potency are scarce. While the self-assessment-mannequins(SAM) measures the dimension of dominance, that is whether the agent feels dominant or dominated by a stimulus, it does not capture the potency of the stimulus. We, therefore, developed a three scale version of the semantic differential(SD). Separate groups of participants rated 480 words with the SAM and the SD. Valence and arousal showed high correlations between the instruments, while potency showed an intermediate correlation. Within SAM potency was highly correlated with arousal, within SD, however, potency did not correlate highly with the other two dimensions. With the SD we introduce an efficient verbal instrument for measuring emotion dimensions, which is capturing the dimension of potency and is thus complementary to the SAM.

The Completion of Missing Information During Coherent Events Is Caused by Backward Inferences Rather Than Predictive Perception

Frank Papenmeier[1], Alisa Brockhoff[1] & Markus Huff[2]
[1]University of Tübingen, Department of Psychology; [2]German Institute for Adult Education, Department of Research Infrastructures
frank.papenmeier@uni-tuebingen.de

Event completion describes the finding that humans sometimes falsely remember that they have seen information that was actually missing within a causally coherent event. It is yet unknown whether event completion is caused by predictive perception or backward inferences. We studied the underlying process with two experiments involving short soccer video clips. We removed a critical moment of ball release in half of the clips. This release moment was followed either by a causal continuation (e.g., ball flying) or a non-causal continuation (e.g., fouled player). We asked participants to detect whether this critical release moment was present in the clip or not. As expected, we observed a completion effect, that is an increased false alarm rate (erroneous reports of having seen the missing information) occurred in the causal condition as compared with the non-causal condition. Completion occurred even when participants responded immediately after the critical release moment (Experiment 1). However, the presentation of a white mask instead of the causal continuation did not result in event completion (Experiment 2), demonstrating the role of backward inferences. We conclude that observers complete missing information during coherent events based on fast backward inferences rather than predictive perception.

Beanspruchungswirkung von Interaktionskonzepten für Nebenaufgaben während der Fahrt

Nikolai Pärsch[1], Arnd Engeln[2] & Martin Baumann[3]
[1]Dr. Ing. h.c. F. Porsche AG, HMI Anzeige und Bedienung; [2]Stuttgart Media University, Market- & Advertising Research, Traffic & Transport Psychology; [3]Ulm University, Human Factors
nikolai.paersch@porsche.de

In vorangehenden Studien (z.B. Strayer et al. (2017)) wurden die visuelle und kognitive Beanspruchung von Infotainmentsystemen untersucht. Neben dem Vergleich von Systemen, standen hier auch Interaktionsmodalitäten und verschiedene Aufgabentypen im Fokus. Doch wie wirkt sich die konkrete Gestaltung einer Aufgabe auf die Beanspruchungswirkung aus? So kann die Gestaltung einer Funktionsauswahl z.B. über eine hierarchische Auswahl über mehrere Ebenen oder durch eine Freitextsuche gelöst werden – bei der Freitextsuche kann u.a. in manuelle Eingabe, Eingabe über Gestik oder Eingabe über Sprache unterschieden werden. Wie entwickelt sich hierbei die Beanspruchungswirkung? Im Rahmen eines Fahrsimulatorexperiments wird eine typische Funktionsauswahl in einem Infotainmentsystem in den vier angesprochenen Varianten während der Fahrt evaluiert. Als Kontrollbedingung bearbeiten die Probanden eine auditive N-Back-Aufgabe in drei Stufen (0,1, 2) (Mehler, Reimer & Dusek (2011)). Die Beanspruchung wird über physiologische, subjektive und leistungsbasierte Maße aufgezeichnet. In der Diskussion wird ein direkter Vergleich der Aufgaben vorgestellt, zudem werden die Messwerte mit den Werten des N-Back-Tasks in Relation gesetzt.

It's the Other Way Around! Early Modulation of Sensory Distractor Processing Induced by Late Response Conflict

Bernhard Pastötter & Christian Frings
University of Trier, Psychology Department
pastoetter@uni-trier.de

Understanding the neural processes that maintain goal-directed behavior is a major challenge for the study of attentional control. While much of the previous work on the issue has focused on prefrontal brain areas, little is known about the contribution of sensory processes to the regulation of attentional control. An EEG study is reported that examined brain oscillatory activities invoked in the processing of response conflict in a lateralized single flanker Eriksen task, in which single distractor letters were presented either left or right to the targets. Distractors were response compatible, response incompatible, or neutral in relation to the responses associated with the targets. Behavioral results showed that responses in incompatible trials were slower and more error prone than responses in compatible and neutral trials. Electrophysiological results revealed an early sensory lateralization effect in evoked theta power, which was more pronounced in incompatible than compatible and neutral trials. The sensory lateralization effect preceded in time a prominent midfrontal conflict effect in induced theta power. The findings indicate a rapid modulation of sensory distractor processing induced by late response conflict. Theoretical implications of the findings, in particular with respect to theories relating to stimulus-response binding, are discussed.

Visual Perception of the Properties of Deformable Objects

Vivian C. Paulun, Filipp Schmidt & Roland W. Fleming
University of Giessen, Department of Psychology
Vivian.C.Paulun@psychol.uni-giessen.de

Visually estimating the stiffness and elasticity of deformable objects is complex. We aimed to investigate how the human visual system solves this task. We simulated and rendered 20 short animations in which rigid objects interact with a non-rigid target object. We varied the type of interaction as well as the stiffness (or compliance) and elasticity of the target, i.e. whether the deformation was permanent (plastic) or the object returned to its original shape (elastic). Fifteen observers rated the apparent softness, elasticity and deformation of the targets. Observers' estimates were in accordance with the simulated internal properties, but plastic objects were perceived softer than equally stiff elastic objects. Presumably this is because plastic deformations were perceived larger than elastic deformations. In general, there was a strong correspondence between perceived stiffness and perceived deformation. We found that perceptual estimates were well predicted by a model based on seven deformation features (e.g. wobbling, stretching, curving) that we measured in the 3D-meshes underlying our stimuli ($r = .93$). Our work suggests that the visual system might use simple mid-level features of the observed deformation in order to estimate the internal properties of non-rigid objects.

Prediction of Indirect Action Consequences

Mareike Pazen, Tilo Kircher & Benjamin Straube
Philipps-University Marburg, Department for Psychiatry and Psychotherapy
mareike.pazen@staff.uni-marburg.de

The ability to attribute the sensory consequences of voluntary actions to oneself is based on internal prediction models. The use of tools poses a challenge to these predictive mechanisms, as both direct (body) and indirect (tool) action consequences need to be classified as self-produced. During fMRI data acquisition, participants grabbed a handle with their hand or with a tool. The handle was either moved by participants themselves (voluntary movement) or by a custom-made device (involuntary movement). A video of the movement was fed back to a screen in real time or with varying delays (0-417ms). Participants reported the detection of such delays. For both non-tool and tool use actions, preliminary results show a suppression effect i. e., worse behavioral delay detection performances as well as lower blood oxygen level dependent (BOLD) responses in primary sensory cortices for voluntary compared to involuntary movements. These findings suggest that 1) the perception of indirect action consequences resulting from tool use movements is similar to when actions are executed with the hand, 2) they both rely on similar predictive mechanisms, and 3) that tools can serve as an elongation of the self.

Base Rate Task: Not a Measure of Logical Processing

Danielle Pessach & Karl Christoph Klauer
Albert-Ludwigs-Universität Freiburg, Psychologisches Institut
danielle.pessach@psychologie.uni-freiburg.de

BACKGROUND: Dual process theories state that there a two processes involved in reasoning, typically called "Type-1" and "Type-2". A widely used task to assess those two processes is the Base Rate task: participants receive information about the frequency of two groups and then need to judge to which of those a described individual belongs to. Responses in incongruent trials (i.e., description incongruent with base rate) that are based on the description are assumed to reflect heuristic Type-1 processing, whereas responses based on the base rate reflect Type-2 processing. METHODS: We applied the Process-Dissociation-Procedure (PDP) to reanalyse four experiments, in which Bago & DeNeys (2017) use the Base Rate task together with manipulations suppressing Type-2 processing. The PDP allows to separate the processes, rather than just equating processes with tasks. RESULTS: We show that the process based on the base rate is not inhibited by the manipulations, but is enabled. That is, when Type-2 process is inhibited, the values for the base rate parameter increase, whereas the parameter based on the description decreases. CONCLUSION: Basing a response on the base rate is arguably the logical response, but that does not reflect logical Type-2 processing.

Rhythmic modulation of object-based attention in working memory

Benjamin Peters[1], Benjamin Rahm[2], Jochen Kaiser[1] & Christoph Bledowski[1]
[1]Institute of Medical Psychology, Goethe-University Frankfurt am Main; [2]Medical Psychology and Medical Sociology, Albert Ludwigs University of Freiburg
peters@med.uni-frankfurt.de

Attention allows us to prioritize relevant information based on spatial locations, features, or objects. Recently, it has been shown that attention is not sustained but rather fluctuates periodically across time. In particular, the interplay between space- and object-based selection leads to rhythmic patterns in detection rates that differ within and between objects. Working memory (WM) is hypothesized to utilize the same attentional mechanisms as perception. In support of this view, we have demonstrated that the principles of object-based attention in perception also apply to WM: Participants shifted their attention between memorized positions faster within the same object than across different objects. We replicated these findings in the present study. Moreover, manipulating the cue-probe interval in 33-ms steps from 100 to 900 ms during WM retention revealed that this same-object benefit was periodically modulated across time, corresponding to a rate of approximately 6-7Hz. These results suggest that the allocation of attention in WM shows a rhythmic modulation, thus emphasizing the hypothesized correspondence between attentional mechanisms in perception and WM.

The Power of Non-Action: Forming stimulus-response associations via instruction, observation, and imagery

Christina Pfeuffer, Karolina Moutsopoulou, Florian Waszak & Andrea Kiesel
University of Freiburg, Cognition, Action, and Sustainability Unit
christina.pfeuffer@psychologie.uni-freiburg.de

It has long been suggested that stimulus-response (S-R) associations, the basis of behavioral automaticity, could only be formed by actively responding to a stimulus. Yet, recent research demonstrated that merely instructing S-R mappings in the absence of own action was sufficient to establish two components of S-R associations, stimulus-action (S-A) and stimulus-classification (S-C) associations, that affected subsequent behavior. Here, we used an item-specific priming paradigm to assess whether observing an action and mentally imagining an action similarly lead to the formation of S-A and S-C associations. In probe trials, participants classified everyday objects either according to their size or mechanicity by pressing a left or right key. In the preceeding item-specific prime trials, participants either actively classified objects by pressing a key, were instructed regarding S-A and S-C mappings, imagined themselves performing an object classification, or observed a computer hand performing the object classification. Better probe performance for item-specific repetitions in S-C mapping rather than switches suggested that, in all conditions, participants had acquired S-C associations. However, S-A associations were apparently only formed by active task execution and instruction.

Eyes into the future: Temporal shifts of oculomotor action perception during concurrent execution of manual actions

Aleks Pieczykolan & Lynn Huestegge
University of Würzburg, Department of Psychology
aleks.pieczykolan@gmail.com

While bimanual coordination is a widely studied issue in action control, much less is known about temporal coordination of cross-modal actions. From research on reaching for objects, it is well known that the eyes precede manual actions by landing earlier on an object in order to improve manual movement efficiency and accuracy. However, little is known about how humans temporally coordinate eye and hand movements in the absence of a common target object. Specifically, how do they represent simultaneity across the oculomotor and manual effector domains? In the present study, participants were instructed to execute two actions as simultaneously as possible (i.e., to group two responses) within (manual-manual) and across (manual-oculomotor) effector systems. Additionally, participants gave confidence ratings regarding their perceived success in simultaneous execution. While participants were generally able to execute two manual actions at the same time, simultaneously perceived cross-modal actions were executed asynchronously: Oculomotor actions (i.e., saccades to a designated target) predated manual actions, which suggests that participants' oculomotor action perception was shifted towards the future. The present results will be discussed with respect to input-related (perceptual) oculomotor temporal predating effects, while generally pointing towards different temporal reference frames for the manual and oculomotor effector domain.

Mental Rotation and Handedness: Differences in object-based and egocentric Transformations

Stefanie Pietsch & Petra Jansen
Universität Regensburg, Institut für Sportwissenschaft
stefanie.pietsch@ur.de

This study investigates mental rotation performance of right- and left-handers in object-based and egocentric mental rotation tasks using body stimuli with an outstretched hand in front and back view. Generally right-handers show slightly better mental rotation performance than left-handers, but right- and left-handers show different hemispheric preferences and strategies during solving spatial tasks. Additionally, different processing strategies are supposed for object-based and egocentric mental rotation tasks (same-different versus left-right judgments). The results showed different reaction time increase with growing angular disparity for object-based, $F(7,280) = 73.86$, $p < .001$, $?p2 = .65$, and egocentric transformations, $F(7,280) = 38.87$, $p < .001$, $?p2 = .49$. Stimuli in the front view required longer reaction times than the ones in the back view, $F(1,40) = 12.91$, $p = .001$, $?p2 = .24$. We found an advantage of right-handers in front view object-based transformation but no differences in egocentric transformations. Due to a more holistic processing strategy left-handers showed significantly longer reaction times in front view object-based tasks, $t(13) = 2.82$, $p < .05$. This difference disappeared in egocentric tasks due to the modification of one´s own perspective to solve the task.

Evaluative conditioning as a tool to study the interplay between perception and emotion

Ferdinand Pittino & Anke Huckauf
Ulm University, Department for General Psychologie
ferdinand.pittino@uni-ulm.de

Emotional stimuli are prioritized in processing compared to neutral ones. In order to investigate early sensory processing of emotional stimuli, evaluative conditioning (EC) was used in order to assure for identical sensory features in neutral and emotional stimuli. EC is commonly defined as the change in liking of a conditioned stimulus (CS) by pairing it with affective unconditioned stimuli (UCS). In two series of experiments, we examined the applicability of EC as a tool to study the effects of emotion on perception. In the first series, compared to the CSneutral, the CSnegative was rated to be more negative and arousing, elicited larger pupils, and was temporally overestimated. In the second series, crowding effects were examined. CSnegative targets were easier to identify and CSnegative flankers were more distracting than CSneutral ones. In sum, the studies strongly suggest affective processing of the CS and facilitated processing of emotional stimuli. Hence, the studies demonstrate that EC can be regarded as a useful tool to study the interplay between early sensory processing and emotion.

Unfallerhebung mittels der Causal Analysis and Reconstruction of Motor Vehicle Accidents (CarMa)

Christopher Pohr
University of Göttingen, Cognition and Decision Making
cpohr@uni-goettingen.de

Um ein besseres Verständnis der psychischen Einflussfaktoren auf Verkehrsunfälle zu erlangen, wurde die Causal Analysis and Reconstruction of Motor Vehicle Accidents (CarMa) entwickelt. Das Ziel von CarMa ist es, anhand der detaillierten Analyse individueller Unfälle, die an einem Unfall beteiligten Faktoren und ihren Einfluss auf die Entstehung des Unfalls zu bestimmen sowie die kognitiven Prozesse und gemachte Fehler zu identifizieren. CarMa kombiniert eine strukturelle Unfallanalyse mit einer an kognitiven Prozessen orientierten sequentiellen Analyse des Unfallverlaufes. Die Strukturanalyse bezieht die Faktoren aus DREAM 3.0 (Wallén Warner et al. 2008) sowie weitere in der Literatur gefundene Faktoren mit ein. Die Analyse der kognitiven Prozesse, die dem Unfall zu Grunde liegen, baut auf der Cognitive Work Analysis, genauer der Control Task Analysis (Vicente, 1999), auf. Mit dieser Analyse können kognitive Fehler identifiziert werden, die die Entstehung eines Unfalls begünstigt haben. CarMa wird derzeit in einer Studie zu Auffahrunfällen erprobt, bei der Unfallfahrer systematisch zu unfallbegünstigenden Faktoren und zur Unfallfahrt interviewt werden. Bei der Studie kooperierten wir mit der Medizinischen Hochschule Hannover, dem Polizeipräsidium Nordhessen in Kassel und der Polizeidirektion Göttingen. Erste Ergebnisse zu CarMa werden anhand analysierter Unfälle präsentiert.

Effector priming during action observation in combat sports

Andrea Polzien, Iris Güldenpenning & Matthias Weigelt
University of Paderborn, Psychology and Movement Science
andrea.polzien@upb.de

According to simulation theory, observers simulate actions performed by other humans as if they would execute the action themselves (Jeannerod, 2001). In three experiments we tested, if participants' reaction to color targets is influenced by the presence of static images showing a combat sports athlete performing kicks and punches. Participants were asked to react to blue and red targets by either pressing a hand or a foot button. In Experiment 1, the blue and red target frames surrounded the whole pictures, in Experiment 2, circles surrounded the active effector, and in Experiment 3, circles surrounded the passive effector. Results showed no incidental priming effects, when participants reacted to the color of the stimulus frame (Exp. 1), selective priming effects, when the focus of attention was directed to the active effector (Exp. 2), and priming effects of the same size, when the focus of attention was directed to the passive effector. First, this points to the role of directing attention for the co-activation of effectors during action observation in combat sports. Second, it indicates a co-activation of effectors, which is due to a matching process, rather than action simulation.

Contextual flexibility of the representation of action- and sound-related verbs in the motor and auditory systems: An fMRI study

Margot Popp
Ulm University, Department of Psychiatry
margot.popp@uni-ulm.de

Modality-specific theories assume a close link between conceptual knowledge and sensorimotor brain systems. Stable conceptual representations were implicitly supposed for a long time because concepts have been thought to be contextually invariant. Recent views, however, assume a situational recruitment of somatosensory brain regions during conceptual processing. The present fMRI-study investigated the influence of context words on conceptual processing of action- or sound-related verbs. Subjects first performed a context decision task, in which action and sound verbs were presented with a context noun. These verbs were then presented in a subsequent lexical decision task, in which these verbs from the context phase were presented together with new action- or sound-related verbs. Thereafter, acoustic and motor localizer tasks were administered in order to identify brain regions involved in sound and action processing. In the lexical decision task, we found a general context effect in frontal brain areas and differential activation patterns for action- and sound-related verbs depending on contextual pre-activation. These activations partially overlapped with brain regions that were activated by real movements or real sounds, respectively. Differential context-dependent processing of feature-specific word meaning in the respective sensorimotor areas indicates a flexible recruitment of modality-specific conceptual feature information.

Presenting visual stimuli in ultra-high temporal resolution with gaming monitors

Christian H. Poth[1], Rebecca M. Foerster[1], Christian Behler[1], Ulrich Schwanecke[2], Werner X. Schneider[1] & Mario Botsch[1]
[1]Bielefeld University; [2]Rhein-Main University of Applied Sciences
c.poth@uni-bielefeld.de

We present a new method that for the first time allows to present visual stimuli with ultra-high temporal resolution (< 1 ms) on commercially available gaming monitors (with G-Sync). We implemented the method in three different programming languages (C++, Python, and Matlab). For all three implementations, we verified the temporal resolution and precision of visual presentation by means of external measurements. In addition, we demonstrate the application of the method in a psychophysical experiment, showing that object recognition performance improves with fine increases of presentation duration.

Regressive Shrinkage of Primacy Effects in Self-Determined Impression Formation from Samples

Johannes Prager & Klaus Fiedler
Universität Heidelberg
johannes.prager@psychologie.uni-heidelberg.de

Impression formation from incomplete sets of information is a major task of everyday decision making. Examining impression formation by presenting traits for judging virtual persons goes back to Asch (1946). In a recent study (Prager, Krueger & Fiedler, 2017) extending this approach to highly controlled stimulus input, we confirmed that participants rely on primacy effects caused by ecological sampling. Small information samples are much more likely to show extreme and non-ambivalent information. If that is the case, participants are likely to truncate information search. Thus, if participants can truncate sampling themselves, small samples tend to be judged more extreme than larger ones. However, cognitive processing of the ecologically defined input also determines truncation of information search. We assume these processes to depend on context and person (i.e. decision maker). In this study we showed that the primacy effect of judgments (more pronounced judgments for small samples) regresses when time (as an element of context) was changed (that is participants re-evaluated samples they drew themselves earlier) and even more when time and person were changed (other participants re-evaluated the samples the first participants chose).

Distinguishing Gloss from Textured Matte Materials

Konrad Eugen Prokott[1], Hideki Tamura[2] & Roland W. Fleming[1]
[1]Justus-Liebig-Universität, Fachbereich 06 Psychologie und Sportwissenschaften; [2]Toyohashi University of Technology, Department of Computer Science and Engineering
eugenprokott@hotmail.com

Humans easily distinguish matte from glossy surfaces, but the underlying visual computations remain poorly understood. We took a data-driven approach to identifying gloss cues, by learning from large numbers of images. We created 75,000 scenes with varying objects, light-probes and viewpoints, each rendered once with a high gloss (mirror-like) material and once with a low gloss (near-matte) textured material. 10 participants classified 300 such images as glossy or matte, achieving 79-93% correct. We trained several classifiers to distinguish the two materials: linear classifiers trained on simple intensity and colour statistics and Portilla-Simoncelli texture statistics, as well as convolutional neural networks (CNNs) with different depths. Using participants' responses we selected a test set spanning from consistently correctly to consistently incorrectly judged images. We used Bayesian hyperparameter search to identify CNN architectures that correlated highest with humans on this test set. We trained Generative Adversarial Networks of varying depths to create images of the two material categories. Testing these images on human observers, we arrived at a sufficient network depth to imitate those features that humans use to distinguish high gloss from low gloss textured materials. These networks have striking similarities to the CNNs that could predict human judgments.

Agentive coercion in German copula sentences makes you look twice: Evidence from an eye-tracking study

Anna Pryslopska
University of Tübingen, SFB 833
anna.pryslopska@uni-tuebingen.de

An eyetracking during reading study investigated whether the agentive interpretation of German copula predicate constructions involves a semantic reintepretation of the copula. The study, preceded by corpus and acceptability rating experiments, had a 2x2 design with factors: verb (copula "war", behave "sich verhalten"), conjunction (agentive "um", stative "weil"). "Sich verhalten" was a control condition to correct for the conjunctions' word length difference. 40 participants were tested in 4 lists with 60 items/246 fillers (| indicate invisible IAs): Sophie | war/verhielt sich | freundlich, | und zwar | *um* | die Eltern | stolz auf sie zu machen. Sophie was/behaved friendly, namely in order to make the parents proud of her Sophie | war/verhielt sich | freundlich, | und zwar | *weil* | die Eltern | sie gut erzogen haben. Sophie was/behaved friendly, namely because the parents raised her well. The results confirm that the agentive interpretation of the copula requires coercion: copula+"um" was more difficult than copula+"weil". This was visible in first fixation duration (ß=0,SE=0,t=3.8,p<0.001), first pass RT (ß=0,SE=0,t=3.4,p<0.001) and regression path duration (ß=0.4,SE=0.1,t=4,p<0.001) on the conjunction IA. A follow-up study is underway which investigates whether this effect is visible if the adjective is modified by "so". "So" intensifies the adjective, possibly facilitating the agentive interpretation.

The other end of the line: Motivational direction cannot be measured by spatial biases in line bisection

Giulia Pugnaghi[1], Carina Kreitz[1], Daniel Memmert[1] & Robert Schnürch[2]
[1]German Sport University Cologne, Institute of Training and Computer Science in Sport; [2]University of Bonn, Department of Psychology
giuliapugnaghi@gmail.com

Previous research indicates that the two hemispheres of the brain are differently involved in the processing of motivational direction. Approach motivation, induced by positive emotions, is reflected in greater activation in the left hemisphere, whereas avoidance motivation, induced by negative emotions, more strongly activates the right hemisphere. A simple behavioural measure of relative hemispheric activation is the visuospatial bias in the line bisection task. In three experiments we investigated whether the line bisection task can be used to measure approach and avoidance motivation. Negative and positive affect was induced via happy or sad music (Experiment 1, N = 50), happy or terrifying pictures (Experiment 2, N = 70), and happy or frightening videos (Experiment 3, N = 90). While participants' mood was successfully manipulated and power in each experiment was extraordinarily high (> .99), there was no significant effect of mood on response asymmetry scores on the line bisection task (all F's < 1.58, p's > .212). Additional Bayesian analyses also provided no evidence of the hypothesized effect. Thus, visuospatial bias in line bisection does not seem to be a sensitive measure of approach and avoidance motivation induced by positive and negative emotions.

Killing the deadly beauty. Character aesthetics in a video game influences the perceived burden in a moral dilemma situation

Marius Raab, Feliciana Wolff & Claus-Christian Carbon
University of Bamberg, Department for General Psychology and Methodology
marius.raab@uni-bamberg.de

Does aesthetics matter in existential questions? In an opulent video game scene, 51 participants were asked to assume the role of a spaceship captain. The captain has to decide if a blind passenger, a young girl, should be thrown into space. If the girl stays, the spaceship's fuel would run out, dooming everyone. Twenty-five participants saw a scene with a vividly rendered picture of an attractive girl, 26 a picture of an unattractive girl (following ideas by, e.g., Zebrowitz & Montepare, 2005). Participants deciding over the attractive girl's fate rated the task as more difficult (M = 2.96 on a 5-point Likert scale, SD = 1.24) than those confronted with the unattractive girl (M = 1.85, SD = 1.38), evaluated with an independent-samples t-test, t(49) = 3.03, p = .004, Cohen's d = .85). The decision outcome, however, was not related to the girl's attractiveness. In both groups, about half of the participants decided to throw the girl out. The decision to kill the girl immediately was associated with more negative and less positive emotions, indicating that for some the immediate emotional cost for killing the girl would have been higher than the long-term cost of dooming the ship.

The Hard Work of Doing Nothing: Accounting for Inhibitory Costs During Multiple Action Control

Tim Raettig & Lynn Huestegge
University of Würzburg, Institute for Psychology
tim.raettig@gmail.com

Performing many actions at the same time is usually associated with performance costs. However, recent eye tracking evidence indicates that under specific conditions, inhibiting a secondary response can be more costly than executing it, resulting in dual-action benefits. Here, we show that performance gains due to inhibitory control demands are not limited to saccades as a response modality. In our study, participants had to react to a visually presented directional word by either reading the stimulus aloud (vocal modality), pressing the corresponding arrow key on a keyboard (manual modality), or both. Crucially, manual error rates were significantly lower when participants had to respond with both a button press and naming than when they had to respond with naming only. More specifically, in naming-only conditions we observed a high percentage of false-positive manual responses, suggesting difficulties with inhibiting an unwarranted manual action. Thus, our results indicate that difficulties associated with single- (vs. dual-) action control are a stable, domain-general phenomenon which likely arises whenever executory demands are accompanied by substantial additional inhibitory control demands.

Cognitive modelling reveals subjective visibility depends on task-relevant and task-irrelevant features as well as detection of motor errors

Manuel Rausch & Michael Zehetleitner
Katholische Universität Eichstätt-Ingolstadt, Psychologie II
manuel.rausch@ku.de

How do human observers determine the degree to which they are consciously seeing a stimulus, i.e. the subjective visibility? Observers presented with backwards-masked sinusoidal gratings were asked to report both the orientation of the grating as well as the degree of subjective visibility of the grating. The best fit to the joint distribution of orientation responses and degrees of visibility was obtained by the extended weighted evidence and visibility model, according to which subjective visibility is based on 1) sensory evidence about the task-relevant feature of the stimulus, 2) the strength of evidence about task-irrelevant features, and 3) the detection of erroneous motor responses. The pattern of visibility in incorrect orientation decisions was inconsistent with various alternative models, such as signal detection theory, parallel models of metacognition, postdecisional accumulation models, high threshold theory, and weighted evidence and visibility models without error detection. Overall, these results indicate that subjective visibility is not exclusively informed by visual processing: Instead, metacognitive processes such as the detection of motor errors contribute to subjective visibility as well.

Causal perspectives: on carefully providing cues to improve risk understanding

Felix G. Rebitschek
Max Planck Institute for Human Development, Harding Center for Risk Literacy
rebitschek@mpib-berlin.mpg.de

Informing about risks is challenging as risk perceptions affecting behavior depend on how associated probabilities are communicated. To facilitate understanding of those probabilities risk cues (RCs) can be provided (e.g. perspectives). Yet, as selected RCs can distort the perception of the target risk, this should be examined systematically. First, a RC which can be an independent cause of the same risk outcome bears no information apart from its anchoring probability (common-effect condition). In contrast a RC as an additional effect of the target risk informs beyond the anchor (common-cause condition). Second, controllability of RCs can impact on perceived controllability of the risk (non- & controllability condition). Experimental results (4x2 design) showed (N=183) that controllability of the provided RC (without any anchor) not only adjusted risk perception but also estimates towards the ground truth (compared to non-controllability). Moreover, in case of RCs being effect of a common-cause model that enables causal inferences estimates and their accuracies were not distorted by an anchoring probability (in contrast to common-effect RC). Causal relationships and comparable controllability of a provided RC can modify risk perception. This indicates a need for investigating guiding principles to avoid distorting perceptions when communicating with RCs, such as perspectives.

What does money value? The effect of financial value on inattentional blindness

Dennis Redlich[1], Carina Kreitz[1], Daniel Memmert[1] & Robert Schnürch[2]
[1]German Sport University Cologne, Institute of Training and Computer Science in Sport; [2]University of Bonn, Department of Psychology
d.redlich@dshs-koeln.de

Conscious perception often fails when an object appears unexpectedly and attention is focused elsewhere, a phenomenon termed inattentional blindness. While physical salience and personal value increase the probability that an unexpected object is detected, it is still unclear if there likewise is an effect of monetary value on inattentional blindness. A total of 188 (M = 22 years, SD = 3 years) participants first completed a training phase in which they learned associations between perceptual features (color) and reward values (high versus low reward). Afterwards, they performed a static inattentional blindness task in which an unexpected object occurred. We hypothesized that detection rates would be higher for unexpected objects that contain the color that was previously associated with high monetary value than for objects of a color that was previously associated with a low monetary value. However, the results did not support our hypothesis. We speculate that the effect of monetary value is not strong enough to increase the detection rate of an unexpected object. The approach that sustained appearance of the unexpected object would increase the effect of monetary value, was tested through a dynamic inattentional blindness task in an additional experiment and will be discussed.

The visual representation of templates for rejection

Reshanne R Reeder[1], Christian N L Olivers[2] & Stefan Pollmann[3]
[1]Otto-von-Guericke University, Institute of Psychology; [2]Vrije Universiteit, Department of Experimental and Applied Psychology; [3]Otto-von-Guericke University, Institute of Psychology, Magdeburg; Germany Center for Behavioral Brain Sciences
reshanne.reeder@gmail.com

Foreknowledge of visual distractors can speed target detection during search. One important question concerns how this information is represented in preparation for search. Our previous study on the topic provided evidence that the BOLD signal elicited by task-relevant non-target visual information ("negative cue") is suppressed in visual working memory compared to target ("positive cue") and even task-irrelevant ("neutral cue") information. The current study used representational similarity analysis to investigate the representational differences between positive and negative color cues prior to search. We found that positive and negative cues are represented distinctly in visual cortex, but more similarly in frontal, posterior parietal, and occipitotemporal regions compared to neutral cues. This reveals similar attention control mechanisms, but distinct sensory representations for positive and negative cues. Region-of-interest analyses revealed that the different cue colors that were shown in the experiment are represented distinctly when they are positive cues, but not negative or neutral cues, in visual cortex. These results collectively reveal differences between high-level task-related representations and low-level sensory representations for different cue types, providing new evidence for templates for rejection.

"More than enough" or "now more than ever": Destructive versus constructive behavioural correlates of shame in the context of individual and collective wrongdoing depend on victim versus perpetrator status

Jonas Rees
Institute for Interdisciplinary Research on Conflict and Violence
jonas.rees@uni-bielefeld.de

Theoretically, the emotion of shame has been linked with both constructive and destructive behavioural correlates. Individuals experiencing shame, the constructive rationale goes, wish to apologise and make up for what happened to reduce the aversive emotion. The destructive rationale assumes that individuals will try to avoid the shame-evoking incident, person or groups of persons altogether. Attempts at resolving this contradiction have only been partly successful and, empirically, results have been mixed at best. We argue that the emotion of shame can be better understood when we account for (objective or perceived) victim versus perpetrator status. In Study 1, we show that N = 98 students' self-reported shame when recalling an autobiographic memory of being a victim (perpetrator) was negatively (positively) correlated with the intention to talk about what happened with the other person(s). In Study 2, we present data from two representative samples of German (N = 1000) and Israeli (N = 1001) participants and show that shame in the Israeli (German) sample was linked positively (negatively) with the willingness to draw a line under the past and move on. Discussion focuses on the importance of understanding perpetrator and victim shame in order for constructive reconciliation to be possible.

Visuomotor binding

Alexandra Reichenbach
Hochschule Heilbronn, Fakultät für Informatik
alexandra.reichenbach@hs-heilbronn.de

The visual consequences of motor commands are quickly conveyed to the corresponding motor control structures in the brain, which enables efficient visual feedback control of voluntary movements. These processes work remarkably well even in the face of complex visual input or discrepancies between physical actuator and visually perceived effect, e.g. when operating a computer mouse. Using an ambiguous situation in which a single cursor could be controlled by either hand, we investigate the visual and cognitive factors that determine the assignment of a visual stimulus to the corresponding motor command. In a series of experiments we demonstrate the effects of properties of the visual cursor, top-down influences, and the effects of additional elements in the visual scene. Our findings provide first insights into the factors that determine the binding of visual information to the corresponding motor structures to enable fast feedback control. In our modern technical world, the situations in which the consequences of our actions are disconnected from their visual consequences are on the rise. This elevates the significance of visuomotor binding from a biological mechanism to a human factor that needs to be taken into account for designing any technical system that requires quick and intuitive operation.

The role of feature binding demands for the interplay of visual attention and central attention

Christina B. Reimer & Torsten Schubert
Martin-Luther-Universität Halle-Wittenberg, Department of Psychology; Humboldt-Universität zu Berlin, Department of Psychology
christina.reimer@psych.uni-halle.de

Visual attention and central attention are limited in capacity. In conjunction search, visual attention is required to select items and to bind item features, which results in a serial search process. In dual-tasks, central attention is required to bind perceived stimulus to associated response information in Task 1 and Task 2, respectively, which results in sequential performance. Here, we investigated whether central attention is needed for feature binding in conjunction search. In three dual-task experiments, participants completed an auditory two-choice discrimination Task 1 and a conjunction search Task 2. In Experiment 1, the feature binding demands in conjunction search consisted of two features per item, whereas they consisted of three and four features per item in Experiments 2 and 3. When the feature binding demands were low (i.e., two features), the search time analysis based on the locus-of-slack method revealed that visual attention operated independently of central attention. Thus, by default, visual attention and central attention rely on distinct capacity limitations. However, when the feature binding demands were high (i.e., three and four features), the analysis indicated that central attention was necessary for feature binding. To conclude, feature binding demands modulate the interplay of visual attention and central attention.

Das Blickverhalten von Radfahren: Ein Vergleich zwischen Fahrten in realer und simulierter Fahrumgebung

Klaus Reinprecht[1] & Anja Katharina Huemer[2]
[1]Inspectio Forschungsinstitut; [2]Technische Universität Braunschweig, Institut für Psychologie, Ingenieur- und Verkehrspsychologie
a.huemer@tu-braunschweig.de

Radfahrer haben im Vergleich zu motorisierten Verkehrsteilnehmern ein stark erhöhtes Verletzungsrisiko bei Unfällen im Straßenverkehr. Sie werden in Kollisionen häufig von PKW erfasst, die meist auch am Unfall Schuld haben. Dennoch finden sich in Beobachtungen viele Regelverstöße von Radfahrern. Um das „normale" Radfahrverhalten untersuchen zu können, bieten sich Naturalistic Cylcing Studies an, die neben der Verkehrsumwelt auch das Blickverhalten der Radfahrer mit erfassen. Eine erste Studie mit Blickerfassungssystem des Inspectio Forschungsinstituts zeigt, dass dies möglich ist. Um das Verhalten von Radfahrern in kritischen, unfallträchtigen Situationen zu untersuchen, wurde an der Technischen Universität Braunschweig ein Fahrradsimulator aufgebaut und in erprobt. Auch hier wurden die Blicke der Radfahrer erfasst. Der vorliegende Beitrag vergleicht die Blickmuster zwischen natürlichen Fahrten und simulierten Fahrten von N=40 Probanden in Fahrradsimulator mit N=28 Probanden während natürlicher Fahrten auf geraden Straßenabschnitten innerhalb städtischer Szenarien und gibt damit Auskünfte über die externen Validität des im Simulator erhobenen Verhaltens.

Mobile assessment of driver mental states in a simulated driving environment

Julian Elias Reiser
Leibniz Research Centre for Working Environment and Human Factors, Ergonomics
reiser@ifado.de

Driving a car is one of the most important mobility factors in people's lives, though driving itself is a complex interplay of many demanding tasks and mental activities. With increasing age, driving related attentional processes are known to decrease, but neurophysiological consequences for driving are still quite unclear. In this study, the effect of aging on mental driver states was examined during an hour-long simulated driving scenario in an interconnected traffic network, consisting of German "Autobahn", highway, and city segments with prolonged monotonous driving periods. While two age groups (young: 19-26, old: 63-76) with 12 participants each drove along the same track guided by a navigation system, EEG was recorded with a mobile, bilateral, around-the-ear setup (cEEGrids, TMSi, NL). Mental states were operationalized by normalized alpha- and theta-power (band power / whole spectrum power) as physiological correlates of attentional processes and measured over time. Results of a mixed-linear-model showed a significant interaction effect of time on task and age on the normalized frequency-band power. On the one hand, younger drivers' alpha- and theta-power increased over time, indicating attentional withdrawal. On the other hand, elderly participants' frequency-power remained stable, hinting at compensatory mechanisms while driving.

Strategies of response organization: Converging evidence of an individual preference in free concurrent multitasking across different tasks, instructions, and time structures

Jessika Reissland, Jovita Brüning & Dietrich Manzey
Technische Universität Berlin, Department of Psychology and Ergonomics
jessika.reissland@tu-berlin.de

Throughout several different multitasking paradigms hints of individual preferences for response organization strategies can be found, but systematic investigation is mostly lacking. Reissland & Manzey (2016) proposed an approach to examine the individual response organization of two tasks with the same priority in voluntary task-switching with preview. Three groups of participants could clearly be distinguished: (1) blockers, working on long runs of only one task before switching to the other, (2) switchers, switching very often between the tasks, and (3) response groupers, grouping their responses to the two tasks together. We now present converging evidence from six studies using different tasks (simple verbal letter/digit classifications, spatial mental rotation/pattern matching tasks, memory tasks, and calculation tasks), different instructions (neutral or with emphasis on parallel processing), and different time structures (similar/different baseline reaction times, different response-stimulus intervals). Remarkably, each participant of the reported studies could clearly be assigned to one of the three proposed strategies. This converging evidence underlines the relevance of those strategies to describe human behavior when multitasking. However, the distributions of the number of participants per strategy varied among the different characteristics of the studies showing that the applied strategy does not purely depend on an individual preference.

The effect of valence, speed and rhythm of sound on distance estimation

Martin Reuschenbach[1] & Julia Bastian[2]
[1]University Trier, Institute of Psychology; [2]University of Trier, Institute of Psychology
bastian@leuphana.de

We asked what happens if car drivers hear different types of sound and have to guess distances. 90 participants in each of the three experiments were assigned to different groups of sound conditions randomly. They had to guess the distances according to the order of a Latin square. While walking to the experimental setting for about five minutes and guessing the distances the participants heard sounds. In the first experiment, metal music hearer showed overestimation and piano music underestimation. In the second experiment, four groups heard different types of piano music. The groups with pleasant or unpleasant valence of music showed very similar degrees of underestimation as if in situations of no music. The group with slow speed of music was significantly different from the group with fast speed of music. In the slow speed group distances were underestimated and in the fast speed group distances were overestimated. In the third experiment, the rhythmic slow and arhythmic fast groups showed similar patterns as if in a no sound condition. The rhythmic fast condition showed underestimation and the arhytmic slow condition showed overestimation.

Just put it in context: How timing of prime and context information determines unconscious context-specific conflict adaptation

Heiko Reuss & Wilfried Kunde
Julius-Maximilians-Universität Würzburg, Lehrstuhl für Psychologie III
reuss@psychologie.uni-wuerzburg.de

The ability to adapt to swiftly changing contexts associated with different levels of conflict is an astounding feat of cognitive control. This was found to be possible even when the conflict and context information is presented unconsciously through a masked prime stimulus. However, when the context was instead presented by the target instead of the masked prime, no conflict adaptation occurred (Reuss et al., 2014). Here we tested the hypothesis that this is specifically due to the timing of prime and context by varying the prime-target-SOA and presenting the context with the target. In a masked priming paradigm, the position of the target number (above or below the preceding masked prime) changed randomly from trial to trial and signaled either a high or a low probability of conflict (80% vs. 20% incongruent primes). With a long SOA (120 ms), we replicated the finding that no context-specific adaptation occurs. With a short SOA (30 ms), however, participants adapted to the context: the congruency effect was significantly reduced in the high-conflict context compared to the low-conflict context. Overall, this shows again that conflict adaptation is possible even with unconscious conflicts, while further defining the strict preconditions that have to be met.

To solve several conflicts concurrently, do we need more control or more slowing?

Alodie Rey-Mermet & Miriam Gade
Catholic University of Eichstätt-Ingolstadt, General Psychology
alodie.rey-mermet@ku.de

Responding to two conflicts concurrently, such as answering a phone call while writing an email, has been found to result in better or similar performance than responding to one conflict. To determine whether this interaction between conflicts stems from the interplay of additional control processes (e.g., attentional adjustment or inhibition), we conducted a study in which we combined a Stroop task (which required identifying the color of color words) with a Flanker task (which required identifying a central character among flankers). Participants were asked to respond to the color of a central color word among flanking color words. To increase control requirements, we occasionally asked half of participants to respond to the word meaning. The results revealed that the interaction between conflicts did not stem from additional processes, but rather from a larger slowing in performance. These findings should encourage us to be more cautious when stipulating additional control processes.

Comparing ideo-motor and socio-motor control of eye movements

Eva Riechelmann, Anne Böckler, Tim Raettig & Lynn Huestegge
University of Wuerzburg, Psychological Methods, Cognition, and Applied Research
eva.riechelmann@uni-wuerzburg.de

Socio-motor action control, an extension of ideo-motor theory to the social domain, claims that actions in a social context are determined by anticipating responses they consistently trigger from other people (Kunde, Weller, & Pfister, 2017). In social interaction, eye movements are of special interest as an action domain as they can serve to affect other people's (gaze) behavior. However, eye movement studies so far have not addressed gaze responses of a (virtual) interaction partner as social action effects. Two eye-tracking experiments investigated whether social information processing in the anticipation of saccadic action effects is special, and focused on the impact of exogenously vs. endogenously triggered saccades when acquiring action-effect associations. To examine the occurrence of anticipation, both experiments included congruency manipulations to prime or interfere with any anticipated representation of the subsequent effect signal. We observed congruency effects (as an indicator of effect anticipation) for both social and non-social stimuli, but only when effects were sufficiently salient. Results are discussed within the existing literature on the dynamics of arbitrary (non-social) action effects and on social information processing, focusing on the differences and similarities between social and non-social anticipation-based oculomotor control.

fNIRS evidence for interaction between types of cognitive demands in driving

Jochem W Rieger & Anirush Unni
University of Oldenburg, Psychology
jochem.rieger@uni-oldenburg.de

Driving, like many other control tasks, imposes multiple concurrent cognitive demands. In order to adjust 'Adaptive Automation Systems' to driver's cognitive capacity utilization, we need to be able to distinguish distinct cognitive functions at the brain level and characterize their interaction. Yet little is known about how brain modules recruited by different concurrently occurring demands interact. We performed a realistic driving simulator study in a VR-lab at DLR, Braunschweig with concurrent whole head fNIRS recordings in which subjects were exposed to changing levels of lateral control (LCD, normal highway road width) and working memory load (WML, digit-span n-back (0-back to 4-back) speed regulation task, Unni et al. 2017). On average over subjects, we correctly predicted LCDs in 72% of the timepoints in an out-of-sample cross validation of linear models trained on the fNIRS data separately for each WML. Mean accuracy scores significantly varied across WMLs (range 59% to 85% correct; $F(4,70) = 10.2$, $p < .001$) with better LCD predictions for intermediate WMLs. Training linear predictors on fNIRS data across WMLs severely degraded prediction performance. These suggest that cognitive functions involved in lateral control and working memory recruit different but interacting brain modules.

Aftereffects of imagined inhibition

Martina Rieger & Stephan F. Dahm
UMIT
martina.rieger@umit.at

In motor imagery research, usually executed actions are compared to imagined actions. However, human action control also requires the inhibition of ongoing action. In the present study, we investigated whether people can imagine to inhibit an ongoing action without actually inhibiting it using the stop signal task. In this task, participants perform a visual discrimination task (go task). This is occasionally interrupted by a stop signal (a tone; stop task) signaling participants to withhold the ongoing response. Participants a) executed the primary and stop task, b) executed the primary task but imagined the stop task (i.e. reactions were not actually stopped, but imagined to be stopped), and c) executed the primary task and ignored the tones (control condition). We analysed inhibitory after-effects, which refer to the observation that reaction times are slower in go trials following a stop signal trial than in go trials following another go trial. We observed that inhibitory aftereffects occur after imagined inhibition. They were smaller than after actual inhibition. However, they could not be explained by the presentation of the tone in stop signal trials. In conclusion, imagined inhibition is functionally similar to actual inhibition.

Disentangling effects of mental workload and visual stimulus properties on pupil size

Fabian Ries, Elena Wolf, Philipp Olschowski, Markus Döllken & Barbara Deml
Karlsruhe Institute of Technology (KIT), Institute of Human and Industrial Engineering (ifab)
fabian.ries@kit.edu

In human-machine interaction, eye-tracking parameters such as pupil size are often being taken into account as indicators of mental workload. However, stimulus properties can also have an impact on these. In order to investigate the respective effects on eye-tracking parameters, we conducted an experiment (N = 48) manipulating both mental workload and visual complexity of images independently within a dual-task paradigm. While viewing standardized pictures of different type (black and white drawing, colour drawing or photography) and complexity, participants thereby had to do mental arithmetic. Results indicate that while some eye-tracking parameters such as the number of fixations seem to be mainly influenced by mental workload manipulations, others such as pupil size are also being strongly affected by stimulus properties such as picture type and complexity. Results are being discussed with regard to possible implications. On the one hand, stimulus properties should also be considered in mental workload research incorporating eye-tracking. On the other hand, eye-tracking parameters can be helpful to gain further insights into the processing of visual features such as visual complexity.

Erlernbarkeit von Übernahmeaufforderungen beim hochautomatisierten Fahren

Fabienne Roche, Stefan Brandenburg & Manfred Thüring
Technical University Berlin, Department of Psychology and Ergonomics
f.roche@tu-berlin.de

Übernahmesituationen sind ein sicherheitskritischer Bestandteil hochautomatisierten Fahrens. Fahrer müssen sich innerhalb weniger Sekunden ein angemessenes Situationsbewusstsein aufbauen und die Fahrzeugkontrolle übernehmen. Das vorgestellte Experiment untersuchte erstmals die folgenden zwei Aspekte von Übernahmeaufforderungen in einem statischen Fahrsimulator: 1) Finden Lernprozesse bei wiederholtem Erleben einer Übernahmesituation statt? 2) Hängt das Lernen von der Modalität der Übernahmeaufforderung und der ausgeführten Nebenaufgabe ab? Insgesamt sechs Mal absolvierten die Versuchspersonen eine visuell oder akustisch beanspruchende Nebenaufgabe und erlebten entweder eine visuell oder akustisch präsentierte Übernahmeaufforderung. Nach jeder Aufforderung wurden die Leistung und das Erleben der Versuchspersonen über die TTC, die Reaktionszeit, die Lenkwinkeländerung und das Beanspruchungsempfinden erhoben. Die Ergebnisse zeigen, dass die Versuchspersonen ihr Verhalten über die Zeit ändern; Lernen findet statt. Die wiederholte Darbietung der Übernahmeaufforderung führte beim akustischen Signal zu Verbesserungen im Abstandsverhalten, wohingegen es sich beim visuellen Signal über die Zeit verschlechterte. Eine akustische Aufforderung führt zu besseren und schnelleren Reaktionen als eine visuelle. Darüber hinaus war die Querführung des Fahrzeuges mit einer auditiven Nebenaufgabe besser als mit einer visuellen. Die Ergebnisse legen nahe, dass die Probanden ihr Verhalten über die Zeit verbessern, wenn die Übernahmeaufforderung und die Nebenaufgabe akustisch präsentiert werden. Visuelle Informationsdarbietungen verschlechtern die Übernahmeleistung.

Semantic mismatches and attention shifts to the auditory modality

Jan Philipp Röer[1], Raoul Bell[2] & Axel Buchner[2]
[1]Witten/Herdecke University; [2]Heinrich Heine University Düsseldorf
jan.roeer@hhu.de

Task-irrelevant, to-be-ignored speech disrupts visual-verbal serial recall. Recently, it was demonstrated that distractor sentences with semantically unexpected endings are more disruptive than distractor sentences with semantically expected endings. In the present series of experiments, we tested whether this semantic mismatch effect is the result of attention shifts to the auditory modality. Disruption was reduced when participants were given the opportunity to listen to the upcoming distractor sentence before the trial during a preexposure phase. However, the semantic mismatch effect did not habituate and it did not differ between individuals with high and low working memory capacity. The results do not support the idea that the semantic mismatch effect is primarily due to attentional capture.

Helping hands: Fine motor skills predict basic arithmetic abilities in preschool and first grade

Stephanie Roesch[1], Ursula Fischer[2], Sebastian Suggate[2], Korbinian Moeller[3] & Heidrun Stoeger[2]
[1]Leibniz-Institut für Wissensmedien, Neuro-cognitive Plasticity; University of Regensburg, Department of Educational Sciences; [2]University of Regensburg, Department of Educational Sciences; [3]Leibniz-Institut für Wissensmedien, Neuro-cognitive Plasticity; Institute of Psychology, Eberhard Karls University; LEAD Graduate School and Research Network, Eberhard Karls University
s.roesch@iwm-tuebingen.de

Butterworth (1999) suggested that fine motor skills (FMS) and numbers are functionally related because children use finger-based strategies (e.g., finger counting) during their numerical development. Against this background, specific aspects of FMS (i.e., finger agility) might be more closely related to finger-based strategies and, as a consequence, to arithmetical abilities than others (i.e., visuomotor skills). In two studies, we investigated associations of finger agility (FA) and visuomotor skills (VS) with arithmetic abilities cross-sectionally at preschool (Study 1) and longitudinally (Study 2) from preschool to the end of first grade. Study 1 (N=175) revealed that FA but not VS predicted preschoolers' concurrent arithmetical abilities even when general cognitive abilities (GCA) and other control variables were considered. Study 2 (N=94) expanded upon these findings, indicating that FA but not VS measured in preschool also predicted addition performance 1.5 years later, even when controlling for variables such as preschool arithmetic abilities and GCA. These results indicated that FA, as an aspect of FMS, was specifically associated with concurrent arithmetic abilities but also predicted arithmetic skills longitudinally. Therefore, we conclude that specific aspects of FMS (e.g., FA) might in fact be more closely related to finger-based strategies and arithmetical abilities than others (e.g., VA).

The fine structure in absolute hearing threshold and in frequency discrimination

Niels Röhrdanz & Christian Kaernbach
Institut für Psychologie, CAU Kiel
chris2018@kaernbach.de

Hearing thresholds of healthy listeners show a fine structure that is stable for an individual listener through many years. Healthy listeners show also a small physiological amount of diplacusis, or interaural pitch difference, with frequency ratios exceeding rarely plus or minus two percent. This diplacusis varies with frequency, and its frequency dependency correlates with the fine structure of the hearing threshold. It does so, however, in a complicated manner, given that the assessment of diplacusis depends on both ears, while the fine structure of the hearing threshold is different for both ears. In the present study we measured the fine structure of the hearing threshold and the fine structure of the frequency discrimination. The advantage over previous studies is that we can compare those fine structures for each ear separately. We find distinct fine structure in about half of the tested frequency regions. They do not correlate between ears, justifying the study of frequency discrimination performance for each ear separately.

Does temporal attention aid feature-based target selection? An ERP study

Bettina Rolke, Susanne Dietrich & Verena C. Seibold
University of Tuebingen, Department of Psychology
bettina.rolke@uni-tuebingen.de

In this study, we investigated whether temporal attention, i.e., the process of anticipating the temporal occurrence of a stimulus, selectively aids the processing of task-relevant stimulus features. We presented visual stimuli of different colours at specific points in time, which were announced validly or invalidly by explicit temporal cues. Participants made a speeded choice response only to stimuli that matched a predefined target colour and only if they occurred at the validly cued point in time. We observed a latency reduction for perceptual event-related potentials (ERPs) evoked by stimuli presented at the validly announced time point compared to those evoked by temporally unexpected stimuli. Moreover, we observed an amplitude enhancement for ERPs evoked by target-coloured stimuli compared to non-target-coloured ones. This perceptual feature-based selection of targets, however, was not modulated by temporal attention. The selection of targets based on temporal validity seems to happen late in the stimulus processing chain as the target-coloured stimuli presented at the invalid time point still evoked a lateralized readiness potential (LRP) indicating response activation. Taken together, the results show that temporal attention speeds perceptual processing, but seems not to aid feature-based target selection at a perceptual level.

Age simulation and office work

Florian Röser, Swaantje Elsen, Ina Hendricks & Daniela Lohaus
University of Applied Sciences Darmstadt, Economic Psychology
florian.roeser@h-da.de

Does age influence the productivity in office work? How does it impact performance, emotion and job satisfaction of workers? There are different ways to examine this: you could ask workers of old age, but would they give truthful and unbiased answers? You could ask their colleagues or supervisors, but will this be fair and how would they know about their job satisfaction? We used another way: Referring to the stress-strain-model we simulated old age with the GERT®, a GERontologic test suit. The task for the participants – half of them with the age simulation suite; the other one just with a workman overall – was to handle simple office tasks testing their visual-, auditory perception, mental and physical/motoric performance (e.g., recognition of text passages; put a letter into an envelope, fill in a table at the computer). In a first experiment (N=50) we measured the possibilities, the limits and the participants' evaluation of the simulation suit, as well as the effect on speed and efficiency in which the office tasks were accomplished. Further, participants' rated their emotions and cognitions (such as perceived stress, job satisfaction and self-efficacy). We will discuss these findings and show further ideas and experimental approaches.

Neuronale Korrelate der Emotionsverarbeitung im Attentional Blink: eine EEG-Studie

Marie-Luise Roth, Maximilian Bruchmann & Thomas Straube
University Münster, Institute of Medical Psychology and Systems Neuroscience
MarieLuise.Roth@googlemail.com

Viele Studien haben in der Vergangenheit emotionale Reize in ihrer Wahrnehmbarkeit manipuliert um zu klären, ob Emotionsverarbeitung auch ohne Bewusstsein stattfindet. Die Widersprüchlichkeit der Befunde kann u.a. dadurch erklärt werden, dass verschiedene experimentelle Paradigmen das Bewusstwerden der Reize auf verschiedenen Verarbeitungsstufen unterbrechen. In der vorliegenden Studie wurden emotionale Gesichter in einem Attentional Blink Paradigma als T2 dargeboten. Hierbei wurde der Kontrast der Gesichter individuell so kalibriert, dass sowohl bei Lag 4 als auch bei Lag 9 die Reize zu 50% wahrgenommen bzw. nicht wahrgenommen wurden. Entsprechend dem klassischen Attentional Blink-Effekt, zeigte sich, dass bei Lag 4 für die kritische Performanz ein höherer Kontrast als bei Lag 9 notwendig war. Man kann demzufolge annehmen, dass bei Lag 4 ein Nichtwahrnehmen der Reize vornehmlich durch das Fehlen von Aufmerksamkeit bestimmt ist, während bei Lag 9 eher die geringe Reizintensität entscheidend scheint. Somit lassen sich im vorliegenden Paradigma Emotionseffekte von Gesichtern untersuchen, deren Wahrnehmbarkeit auf hoher (Lag 4) und auf geringer (Lag9) Verarbeitungsstufe gestört wurde. Im ereigniskorrelierten Potential (EKP) beobachteten wir eine Modulation des differentiellen Emotionseffektes durch den Faktor Lag. Dies liefert einen Hinweis darauf, dass unbewusste emotionale Verarbeitung nur dann stattfindet, wenn eine Bewusstwerdung erst auf einer höheren Verarbeitungsstufe gestört wird.

Enhanced colour perception and memory for colours in grapheme-colour synaesthetes and colour experts

Nicolas Rothen & Rebecca Ovalle Fresa
University of Bern, Department of Psychology
nicolas.rothen@gmail.com

Synaesthesia is associated with extraordinary experiences elicited in the presence of an appropriate inducing stimulus. For instance, in grapheme colour synaesthesia (GCS) an achromatic letter may elicit a highly specific colour experience. Previous studies reported enhanced colour perception in GCS and other studies provided empirical evidence for enhanced colour memory in GCS. This led to the suggestion that enhanced perceptual processing in synaesthesia may be responsible for enhanced memory performance. However, perceptual processing and memory performance has never been directly compared in a single study. Thus, it was our primary goal to compare perceptual processing and memory performance in a group of GCS, non-synaesthetic colour experts (NCE) and non-synaesthetic controls (NSC). GCS and NCE outperformed NSC in both, perceptual processing and memory tasks, while GCS and NCE showed similar performance in both tasks. We conclude that enhanced memory performance in GCS and NCE is associated with enhanced perceptual processing.

Spatial referencing across languages

Annelie Rothe-Wulf[1], Sieghard Beller[2] & Andrea Bender[2]
[1]University of Freiburg, Department of Psychology; [2]University of Bergen, Department of Psychosocial science
annelie.rothe@psychologie.uni-freiburg.de

As one of the core domains of cognitive psychology, spatial cognition triggered a variety of research questions, such as how spatial information is represented, memorized, used for navigation, or how it is communicated among individuals. In the interplay of these diverse research fields, discussions arose about the causal role that language might play in spatial cognition. Most prominently, conceptualizations of spatial frames of reference (FoR) had been used to contrast the effects that linguistic preferences of either viewer-centered (relative) FoRs or field-oriented (absolute) FoRs might have on spatial cognitive processes. However, what had been neglected so far, were preferences for and implications of different subtypes of relative referencing strategies within and across speech communities. Implementing diverse tasks and paradigms in several languages, we scrutinized preferences for specific relative referencing strategies and their indications for other domains, such as temporal reasoning or evaluative judgements. The results hint at cross-linguistic differences in (a) the preferred relative referencing strategies, and (b) the interindividual variability of FoR preferences within speech communities. For all languages, the preferred spatial referencing strategies showed no or only weak correspondence with the temporal domain, but they had effects on evaluative judgements.

Infants' Mental Rotation and Recognition of 3D Objects – the Relevance of Stereovision

Martina Röthlisberger & Andrea Frick
University of Fribourg, Department of Psychology
martina.roethlisberger@unifr.ch

In this longitudinal study, we investigated the relation between emerging stereovision and infants' recognition and mental rotation of three-dimensional (3D) objects. Infants (N=32) were tested at 4 and 7 months of age. Stereovision was assessed using the Lang-Stereo-Test® in a preferential-looking paradigm. Object recognition and rotation were tested in a violation-of-expectation paradigm. An object rotated 180° in the picture plane, was occluded by a blackout, and reappeared either in the original or a mirrored version in three different orientations: the final rotation position (baseline), rotated 60° further in the same plane (extrapolated), or rotated 60° in an orthogonal plane. An analysis of the time infants looked at the objects after reappearance showed that at 4 months, infants with stereovision, and mainly girls, looked longer at the mirrored than the original objects, indicating that they were able to mentally rotate the objects and recognize them in a 3D environment. At 7 months, infants differentiated mirrored and original objects regardless of orientation and sex, suggesting robust object recognition and mental rotation. The findings indicate that mental rotation emerges between 4 and 7 months and is qualified by developing stereovision.

Implicit sequence learning despite multitasking: the role of (flexible) separation of task representations

Eva Röttger[1], Hilde Haider[1], Fang Zhao[2] & Robert Gaschler[2]
[1]University of Cologne, Department of Psychology; [2]FernUniversität in Hagen, Department of Psychology
eva.roettger@uni-koeln.de

Recently, Röttger, Haider, Zhao and Gaschler (2017) found dual-task implicit sequence learning despite unpredictable co-occurring events (SOA = 0 ms) only when 70% single-task trials were intermixed into the dual-task. Here, the cognitive system might have become biased to predict upcoming events within the sequence learning task – rather than across the tasks – thereby enabling the reduction of the prediction error and, thus, learning. Schumacher and Schwarb (2009) have already shown that temporal separation (SOA > 0 ms) of two – randomly paired – tasks (a sequence learning- and a tone discrimination task) also enables learning. A time gap between two tasks may cause separate task representations – thereby, again, fostering beneficial within-task predictions. In the present experiment we compared three conditions, SOAlong, SOAzero and SOAmixed, to investigate whether the cognitive system can flexibly switch to a processing mode that implements separate task representations – given that the SOA-length is predictable. Therefore, in the SOAmixed condition, two of four positions in a sequence learning dual-task predicted a long SOA with a probability of 75%. If the separation of representations can indeed be implemented flexibly, we should find learning not only in the SOAlong – but also in the SOAmixed condition.

Is negation used to predict upcoming referents in a visual world paradigm?

Franziska Rück[1], Hartmut Leuthold[2], Carolin Dudschig[1] & Barbara Kaup[1]
[1]University Tübingen, Language & Cognition; [2]University Tübingen, Biological Psychology
franziska.rueck@uni-tuebingen.de

One typical use of negation is to refer to exceptions. With respect to a visual display showing several similar items and one exception, referring to the exception by means of a negation should therefore be pragmatically felicitous. We investigated whether comprehenders use pragmatic reasoning to predict upcoming objects in negative sentences. In Experiment 1, participants read affirmative and negative sentences referring either to the exception or to the other objects in strongly biased displays. Additionally, unbiased displays were implemented showing equal numbers of objects of each type. Identification times of the correct referent were shorter with the biased display independent of sentence polarity. Thus, participants did not predict upcoming objects based on pragmatic reasoning specific to the use of negation. Critically, in the biased displays, the exceptional object was highly salient which might have initially drawn the participant's attention to this object, resulting in a general speed-up. In Experiment 2, we therefore used a biased display with reduced saliency of the exceptional object. The effect of display disappeared; however, again negation did not result in a specific speed-up due to pragmatically correct negation use. Thus, negation does not seem to facilitate the identification of an exceptional object.

Negotiations by proxy are influenced by the client's identity

Janna Katrin Ruessmann & Sascha Topolinski
University of Cologne, Social Cognition Center Cologne
jannakatrin@googlemail.com

Many professions require conducting negotiations on behalf of another individual, i.e., a client. For instance, individuals consulting a lawyer, or appointing a financial advisor, expect those professionals to negotiate in their best interests, and to precisely know which decisions needs to be taken on their behalves – and which not. This expectation prompts the following question: does the identity of a client influence the professionals in their efforts to decide in their client's best interest? The present research investigates this question employing a within-subjects manipulation of social distance. Participants are instructed to decide about unfair and hyper-fair offers in an ultimatum game directed at either themselves or a client. In a pilot experiment (N=68) this client was either a friend of the participant or a stranger. Experiment 1 (N=167) was a pre-registered replication of the pilot. In Experiment 2 (N=90) two additional layers of client identity were realized, namely a family member and an acquaintance. Across these experiments the following replicable pattern surfaced: there was no impact of client identity on the acceptance rates for unfair offers. In contrast, participants systematically accepted more hyper-fair offers for themselves and close others than for socially distant clients.

Identity-specific coding of newly instructed task rules in the human brain

Hannes Ruge
Technische Universität Dresden
hannes.ruge@tu-dresden.de

Learning novel tasks proceeds most efficiently when the appropriate rules are specified prospectively via explicit instructions rather than retrospectively via feedback as in trial-and-error learning. It has remained unclear how such newly instructed rules are initially represented in the brain and how these neural representations might change across the first few implementation trials during an early stage of short-term task automatization. The rationale of the present study was to track the sensitivity of multi-voxel activation patterns for instructed individual rule identities (for instance, a left index finger response upon stimulus A compared to the same response upon another stimulus B). This stimulus-response (S-R) learning condition was compared to another condition that was identical except that S-R learning was prevented and subjects were required to perform a one-back task on identical stimulus sequences. This enabled us to identify brain regions that exclusively represented newly instructed S-R rules, one-back rules, or both. We found evidence for all three types of rule representations in distinct frontal cortex brain regions. These representations were detectable already directly after instruction and further throughout practice. Interestingly, however, early and late practice phase rule representations were highly dissimilar suggesting profound representational transformation processes.

Context-dependent attentional decoupling and its relation to prospective memory

Jan Rummel
Heidelberg University
jan.rummel@psychologie.uni-heidelberg.de

Prospective memory (PM) refers to the ability to remember executing an intention in the future. It has been argued that attentional decoupling, which comes at a cost to currently ongoing tasks, may be adaptive for PM (Cohen, 2013; Rummel, Smeekens, & Kane, 2017). That is, PM-related thoughts occurring during an ongoing task may help to keep the intention active. However, to be truly adaptive, PM-thoughts should primarily occur in situations where intention-fulfillment opportunities are likely. To test this idea, in two experiments, participants formed the intention to respond to animal names (PM cues) with a special response while performing a lexical-decision task. In Experiment 1, the intention was suspended during a first task phase during which participants were sometimes probed on their thoughts. Few PM-thoughts were reported unless PM cues occurred in this phase. In Experiment 2, the font color of the lexical-decision-task items was varied block-wise and half of the participants were informed that the PM cues would always have one specific color. Thought reports showed that participants who knew about the intention–font-color association experienced fewer PM-thoughts during blocks with the intention-unrelated color. Results are discussed with regard to which adaptive strategies people can use to remember intentions.

Are You Sure You Want to Delete This? The Costs of Losing the Possibility of Memory Offloading for Subsequent Memory Performance

Yannick Runge, Christian Frings & Tobias Tempel
University of Trier, Department of Cognitive Psychology
runge@uni-trier.de

The storing of memory content on digital devices can have beneficial effects for subsequent memory performance as Storm and Stone (2015) recently reported. They found enhanced recall for items encoded subsequently to a saving cue that instructed participants to save before learned items into a computer file. The present study replicated and extended this effect in a first experiment. The beneficial effect of memory offloading due to saving could be shown. In addition a comparable benefit occurred when participants kept already saved encoded material, compared to trials that required participants to delete it. We assume that the deletion of formerly stored information produces proactive interference. Intentionally keeping files in no-deletion trials reduces this interference, in an equivalent manner as benefits of directed forgetting. In a second experiment we specified whether the beneficial effect of offloading is exclusively found due to a reduction of proactive interference or can also be found in an experimental design examining retroactive interference. No such effects were found, suggesting that saving-enhanced memory might be restricted to a reduction of proactive interference, again equivalent to benefits of directed forgetting. These results support the benefits of memory offloading and specify the underlying mechanisms.

Consistent irrelevant response effects enhance implicit sequence learning

Jascha Rüsseler[1] & Daniel Wiswede[2]
[1]Department of Psychology, Otto-Friedrich-University Bamberg; [2]Department of Neurology, University of Lübeck
Jascha.Ruesseler@uni-bamberg.de

The present study investigates how irrelevant response effects influence implicit sequence learning. Participants performed a modified version of the serial reaction time task (SRTT). In this task, one of four keys corresponding to four letters on a computer screen has to be pressed. Unknown to participants, in some parts of the blocks the stimuli appeared in a deterministic sequence, whereas in the remainder of the blocks the stimuli were presented randomly. After each key-press, a task-irrelevant short tone was presented. Four groups with different response-key to response-effect mapping were created (no tone presented; random tone, i.e. each response-key was associated with four different tones; one-to-two-mapping, i.e. each response-key was associated with two different tones; one-to-one-mapping, i.e. each response-key was associated with one tone). Explicit knowledge of the sequence was assessed with a free-recall and a sequence generation procedure. Implicit learning was enhanced for the two-to-one and for the one-to-one mapping groups. Furthermore, the presence of irrelevant response-effects fostered the development of explicit sequence knowledge. These results are discussed within a dual-process model of explicit and implicit learning and consciousness.

When Less Is More: Costs and Benefits of Varied vs. Fixed Content and Structure in Short Term Task Switching Training

Katrina Sabah[1], Thomas Dolk[1], Nachshon Meiran[2] & Gesine Dreisbach[1]
[1]Regensburg University, General and Applied Psychology Department; [2]Ben-Gurion University of the Negev, Psychology Department
katrina.sabah@gmail.com

Heretofore, little is known about which and how the different aspects of task variability impact cognitive training outcomes. This study systematically examined the impact of variability across different task components on outcome measures in short-term task switching training, manipulating surface features (i.e. introduced stimuli and task rules) and the deeper structural task configuration (i.e. repeat/switch trials sequence). Four training variability conditions were compared: Fixed content\Fixed structure; Fixed Content\ Random Structure; Varied Content\Fixed Structure and Varied Content\Varied Structure. The experiment included baseline block, seven training blocks (learning phase), followed by two (near) transfer blocks, one with fixed and one with random task structure, respectively. In the learning phase, training gains appeared more rapidly in the fixed content as compared to the varied content conditions. Interestingly, training with fixed content entailed significant costs when transferred to novel task switching context on both switch and repeat trials. In contrast, moderate transfer gains were noted in the varied content condition, manifested specifically on switch trials. These results suggest that task (content) variability is one means to improve positive transfer and avoid negative transfer. Additionally, training gains seem harmful for learning generalization.

How does Working Memory Capacity influence Extraction Behavior in CPR Dilemmas? - An Agent-Based Modeling Approach

Nadia Said[1], Debora Fieberg[2], Helen Fischer[1], Johannes Lohse[3] & Christian Kirches[4]
[1]Heidelberg University, Experimental and Theoretical Psychology; [2]Heidelberg University, Interdisciplinary Center for Scientific Computing (IWR); [3]University of Birmingham, Department of Economics; [4]TU Braunschweig, Institut für Mathematische Optimierung
nadia.said@psychologie.uni-heidelberg.de

International fisheries, water or forests can be conceptualized as common pool resources (CPR). In our experiment we identified the working memory capacity (WMC) as a key driver of individual extraction behavior in a CPR simulation game. In particular we showed that, in the group condition, participants with a higher WMC were more likely to extract too much, causing a premature breakdown of the resource. In order to investigate the optimal level of WMC for sustainable resource use, we combine agent-based modeling (ABM) with ACT-R an architecture used for modeling cognitive processes. Using the ACT-R declarative memory module we can vary different parameters, like W (working memory) and tau (retrieval threshold) which represent the cognitive abilities of agents and therefore influence their extraction behavior. In this contribution we present our approach to combine our mathematical model of the ACT-R declarative memory module (Said et al. 2016) with ABM. We discuss the application of mathematical optimization methods which will allow us to investigate (a) the distributions of agents decision strategies which are optimal for a sustainable development of the resource (b) the optimal distribution of WMC and (c) if a limitation of WMC is beneficial for an overall optimal decision process.

The epigenetics of depression: Methylation of the promoter region of the serotonin transporter (SLC6A4) moderates the association between critical life events and depression

Simon Sanwald, Christian Montag, Katharina Widenhorn-Müller, Carlos Schönfeldt-Lecuona, Maximilian Gahr & Markus Kiefer
Universitätsklinikum Ulm, Klinik für Psychiatrie und Psychotherapie, III Sektion für kognitive Elektrophysiologie
simon.sanwald@uni-ulm.de

Epigenetic investigations are incrementally getting closer into focus of psychological research. Trauma, anxiety-related personality traits and depression have frequently been associated with alterations in the methylation pattern of the promoter region of the serotonin transporter gene (SLC6A4). However, the exact effect of the serotonin system on anxiety-related personality traits and depression remains an issue of controversial debate. The aim of this study was to further explore the association between SLC6A4 promoter methylation, stressful life events, primary emotions and depression. We therefore measured the methylation status of 71 CpG (5'-Cytosine-phosphate-Guanine-3') sites of the promoter region of SLC6A4 in 69 patients with major depression. The data were analyzed with respect to self-reported critical life events (CLEQ), primary emotions (ANPS) and depression severity (BDI-II). While there were no significant associations between SLC6A4 promoter methylation and primary emotions, methylation status of single CpG sites was significantly associated with critical life events and depression severity. We also found a moderation effect with the association between critical life events and depression being significantly stronger in case of lower methylation levels of a single CpG site (bp25586809). Thus, methylation of the promoter region of SLC6A4 may be a factor influencing the relation between trauma and depression.

Decoding the P600: MVPA evidence for shared neural patterns underlying Oddball and syntactic violation processing

Jona Sassenhagen & Christian J. Fiebach
University of Frankfurt, Department of Psychology
jona.sassenhagen@gmail.com

The P600 Event-Related Brain Potential is usually interpreted as indicating language-specific structural/combinatorial processing, with wide-reaching implications. P600 experiments critically inform models of language processing. Moreover, P600 effects in non-linguistic paradigms are widely seen as evidence for language-like grammars in domains like music, visual processing or arithmetic. An alternative interpretation, rendering such cross-domain reverse inference invalid, equates the P600 with the P3, a domain-general response to salience. We conducted a typical P600 study jointly with a non-linguistic Oddball experiment (eliciting a P3). Multivariate pattern analysis was used to test if neural patterns from the Oddball experiment re-occur in the linguistic experiment. Trials from the language experiment could be reliably classified on the basis of P3 patterns occurring during the P600 time window. In a second experiment, we replicate the primary finding and demonstrate its specificity by comparing it to cross-decoding from face processing or semantic mismatch associated EEG responses. The cross-domain nature of P600 patterns speaks against its interpretation as a language-specific index of structural/combinatorial processing. The P600, thus, provides no direct evidence for language-like grammars in non-linguistic domains.

Planning and cognitive representation in manual action

Thomas Schack
CITEC; Neurocognition and Action - research group Bielefeld University
thomas.schack@uni-bielefeld.de

It has been shown that grasp postures are influenced by the goal of recently planned action. In different experimental studies with children and adults we found arguments for anticipative motor planning effects in manual action. Results of studies coming from a sequential object manipulation task and from a dowel placing task. In this context we investigated furthermore the cognitive representations of objects and the representation of grasping postures in memory. Subjects with grasp comfort related and functionally well-structured representations were more likely to have prospective motor planning than subjects whose cognitive representations were not structured by anticipated grasp comfort. The results of such studies support the notion that cognitive action representation plays a role in the planning and control of grasp postures. Another line of research adressed retrospective aspects of motor planning in sequential tasks. It has been argued that such sequential hysteresis effects reduce the movement planning costs by modifying the former plan instead of creating a new movement plan from scratch. Results from different studies with a sequential, perceptual-motor task are presented and providing further hints for the incorporation of cognitive processes in manual action.

Expertise in a demanding cognitive-motor dual-task situation: Performance advantages of table tennis experts compared to novices

Sabine Schäfer
Saarland University, Institute of Sports Sciences
sabine.schaefer@uni-saarland.de

Theories on the acquisition of motor skills predict that earlier stages of skill acquisition require more attentional resources than later stages (Fitts & Posner, 1967). Novices should therefore show higher dual-task costs when performing a motor skill and a cognitive task concurrently. Most studies have focused on performance changes in the motor task (for a review, see Schaefer, 2014), neglecting potential performance decrements in cognition or possible trade-offs between the two task-domains. The current study compared expert and novice table tennis players (n = 11 per group) who returned balls from a ball machine while concurrently performing an auditory 3-back task. Balls and numbers were either presented simultaneously or with a time-delay. There were no group differences in 3-back performance in the single task. Both experts and novices showed dual-task costs in cognition, but performance decrements were more pronounced in novices. A similar pattern emerged for the number of missed balls in table tennis, except that experts outperformed novices already in the single-task. In proportional dual-task costs, experts consistently showed costs of about 10 %, while novices showed costs between 30 and 50 %. The findings indicate that performances of novices suffer considerably in motor and cognitive domains.

How to stay positive: Integration or prevention of integration of negative content to the self

Sarah Schäfer[1], Dirk Wentura[2] & Christian Frings[1]
[1]University of Trier, Department of Cognitive Psychology; [2]Saarland University, Department of Cognitive Psychology and Statistics
schaefers@uni-trier.de

The self has been identified as an important factor influencing various cognitive processes. However, research on effects of self-relevance was fundamentally influenced by the introduction of the so-called matching paradigm (Sui, He, & Humphreys, 2012). In this paradigm, arbitrary stimuli are associated with the participant's self or a non-self-relevant other via instruction. In a subsequent matching task, a self-prioritization effect is measurable, indicated by faster responses to self-related compared to other-related associations. Previous findings with the matching paradigm indicate that self-representations are specific and functional (Schäfer, Frings, & Wentura, 2016; Schäfer, Wentura, & Frings, 2015). In order to test whether the integration of instructed self-associations is unavoidable or whether a striving for a positive self-representation can prevent harmful self-associations, we used the matching paradigm to assess the integration of negative stimuli to the self. In a series of experiments we tested the integration of negative stimuli to the self by comparing a typical matching-paradigm condition (including neutral stimuli) with a condition in which participants learned associations with weapon symbols (Exp. 1) or with negatively-tagged geometric shapes (using an evaluative-conditioning procedure; Exp. 2). The results show that the self-prioritization effect was significantly modulated by the valence of the associated stimuli.

Reliance on Schemas in Metamemory Predictions: Differences between Judgments of Learning and Judgments of Source

Marie Luisa Schaper[1], Beatrice G. Kuhlmann[2] & Ute J. Bayen[1]
[1]Heinrich-Heine-Universität Düsseldorf, Institut für Experimentelle Psychologie, Mathematische und Kognitive Psychologie; [2]Universität Mannheim, Fachbereich Psychologie, Kognitive und Differentielle Psychologie
marie.schaper@uni-duesseldorf.de

Metamemory research has thus far mostly focused on determinants of Judgments of Learning (JOLs). In source monitoring, JOLs and Judgments of Source (JOSs) can be used to assess participants' item-memory and source-memory predictions, respectively. In such tasks, people predict better memory for schematically consistent than inconsistent source-item pairs, with a stronger effect on JOSs. We asked whether these expectancy effects in predictions rely on schematic consistency or inconsistency between items and two possible sources. Participants (n = 96) studied consistent (e.g., nightstand - bedroom) and inconsistent (e.g., bed - bathroom) source-item pairs. The degrees of source-item consistency and inconsistency were gradually varied. Participants provided item-wise JOLs and JOSs. Both an item's relationships with its own source as well as with the alternative source influenced memory predictions. Higher consistency of an item with either source resulted in higher JOLs. However, higher consistency resulted in higher JOSs in consistent trials and in lower JOSs in inconsistent trials. Higher inconsistency with an item's own (alternative) source resulted in lower (higher) judgments. These effects were stronger on JOSs than JOLs. Thus, schematic source-item relationships affected both judgments. The differences between JOLs and JOSs indicate that they capture different aspects of metamemory.

Information Search in Every-Day Decisions: The Generalizability of the Attraction Search Effect

Sophie Elisabeth Scharf, Arndt Bröder & Monika Wiegelmann
University of Mannheim, Department of Psychology
soscharf@mail.uni-mannheim.de

The new Integrated Coherence-based Decision and Search model (iCodes; Jekel, Glöckner, & Bröder, under review) makes the unique prediction that the direction of information search depends on the already available information. It predicts that information is searched for the currently more attractive option, the so-called Attraction Search Effect. Two experiments by Jekel et al. supported this prediction using a probabilistic inference task, set in an abstract stock market scenario. The goal of this project is to test whether the Attraction Search Effect generalizes to preferential choice tasks in more realistic decision scenarios. Two online experiments were conducted that presented participants with every-day decision scenarios. The first experiment used an identical task structure to that of Jekel et al. with severely restricted search while employing six different content scenarios. The second study introduced six additional semantic contents while implementing a new task structure with less restrictive search. Both experiments support the existence of the Attraction Search Effect in preferential choice tasks. This shows that the unique predictions of iCodes are not restricted to specific item material and decision scenarios but generalize to a variety of settings. The generalizability of the Attraction Search Effect supports the validity of iCodes's process assumptions.

Sensitivity of pupil dilation and EEG alpha frequency band power for working memory load in n-back and span working memory tasks

Christian Scharinger[1], Alexander Soutschek[2], Torsten Schubert[3] & Peter Gerjets[4]
[1]Leibniz-Institut für Wissensmedien Tübingen; [2]Laboratory for Social and Neural Systems Research, University of Zurich; [3]Department of Psychology, Martin-Luther-Universität Halle-Wittenberg; [4]Leibniz-Institut für Wissensmedien Tübingen; Department of Psychology, Eberhard-Karls-Universität Tübingen
c.scharinger@iwm-tuebingen.de

Pupil dilation and EEG alpha frequency band power (a-FBP) have generally been reported as sensitive measures for working memory (WM) load. For increasing WM load the eye-pupil dilates whereas the parietal a-FBP decreases. In the current study (N = 25) we were interested whether both measures would be comparably sensitive for WM load in two different WM tasks, a digit span (dSpan) and an n-back task that were matched with respect to perceptual and motoric requirements. In the dSpan subjects had to memorize sequences of up to eight single digits in correct serial order while simultaneously indicating the parity of the digits. In the n-back task (1-3-back) subjects had to indicate whether a current digit in a sequence matched the digit n-steps back. As expected, in the n-back task the pupil dilated and the a-FBP decreased for increasing n-back levels. However, the measures showed different sensitivities for different load-levels. In the dSpan the a-FBP decreased for increasing WM load from the first digit on whereas the pupil dilated not until the fourth digit on. Interestingly, both measures indicated overall lower WM load for the n-back as compared to the dSpan task. We will discuss these outcomes in detail.

How does the peak-end rule smell? Tracing hedonic experience with odors

Benjamin Scheibehenne[1] & Géraldine Coppin[2]
[1]University of Geneva, Geneva School of Economics and Management; [2]University of Geneva, Swiss Center for Affective Sciences; University of Geneva, Laboratory for the Study of Emotion Elicitation and Expression; Distance Learning University Switzerland (Unidistance)
benjamin.scheibehenne@unige.ch

The peak-end rule predicts that retrospective evaluations of affective events heavily depend on the most intense and last moment, and it implies duration neglect. The rule was originally proposed for negative experiences such as painful medical procedures. It is unclear however if it also applies to positive experiences. Previously, rigorous comparisons between both domains were hindered because it required qualitatively different stimuli. To overcome this constraint and to test the hypothesis in a genuinely affective domain, we repeatedly presented participants in two experiments (n = 48 each) with continuous sequences of odors delivered directly into their noses using an olfactometer. Participants rated each sequence continuously and provided retrospective ratings afterwards. Odor sequences differed in valence (positive vs. negative), trajectory (increasing, decreasing, u-shaped, and inversely u-shaped), and length (short vs. long). Results based on a multilevel analysis confirm that the peak and the end received higher weight in the retrospective ratings, hence providing evidence for the peak-end rule for both, positive and negative events. Likewise, retrospective ratings were independent of length (indicating duration neglect). Results are discussed in the light of recent research on information integration and affective experiences.

Effects of motor inhibition on n – 2 repetition costs

Juliane Scheil[1], Thomas Kleinsorge[1] & Baptist Liefooghe[2]
[1]Leibniz Research Centre for Working Environment and Human Factors (IfADo); [2]Ghent University
scheil@ifado.de

Research on motor imagery (MI) suggests that overt actions during motor imagery are prevented, either by emitting only subthreshold motor commands to effectors, or because motor command inhibition is evoked. Inhibitory processes are also assumed to be involved in task switching, with n – 2 repetition costs as a behavioral marker. In the present study, we combined both lines of research to investigate the involvement of inhibitory processes in MI. To this end, a task switching experiment was designed in which participants had to switch among three tasks, with responses being executed either overtly or covertly (whereby the latter was assumed to involve MI). Large n – 2 repetition costs were visible for overt responses in n – 2 that were followed by a covert response in n – 1, while in the other conditions, no significant n – 2 repetition costs could be observed. This result suggests that when MI takes places during trial n – 1, inhibition is invoked that also increases the inhibition of the task that was executed in trial n – 2. Furthermore, the results provide evidence for an involvement of motor inhibition in the emergence of n – 2 repetition costs.

L1 and L2 distance effects in learning L3 Dutch

Job Johannes Schepens
Freie Universität Berlin
jobschepens@gmail.com

Cross-linguistic differences have a large and varied impact on the way previously learned languages (L1, L2, ..., Ln) determine the ability to learn an additional language (Ln+1). Understanding this variation is crucial to support learners with different language backgrounds who need to successfully learn additional languages for their day-to-day lives. However, little is known about why cross-linguistic differences are important, what the important differences are, and if their importance varies across previously learned languages (L1, L2, etc.). Here, we show that there are L1 and L2 linguistic distance effects and that they independently influence the learnability of Dutch as an L3: Both larger L1 and L2 distances correlate with lower degrees of L3 learnability. Lexical and morphological distance measures together explained 47.7% of the variation across L1s and 32.4% across L2s. The evidence comes from speaking proficiency test scores on the state exam Dutch as a Second Language by a large number of candidates who speak a diverse set of first languages (L1s) and additional languages (L2s). We conclude that cross-linguistic differences require language learners to bridge varying linguistic gaps between their first and second language competences and the target language depending on linguistic distance.

The psychometrics of the continuous mind: Exploiting the dynamics of mouse movements with time continuous multiple regression

Stefan Scherbaum[1] & Maja Dshemuchadse[2]
[1]Technische Universität Dresden, Department of Psychology; [2]Hochschule Zittau/Görlitz, Department of Social Sciences
stefan.scherbaum@tu-dresden.de

Psychometrics usually relies on discrete measures, e.g. answers in questionnaires or responses in tasks. This focus on discrete measures neglects the information that is present in the process leading to an answer or a response. Mouse tracking promises to open a continuous window on such processes, but mouse tracking studies do not exploit the full potential of the method, that is, the extraction of dynamic, psychometrically valid markers for the different sub-processes which are intertwined on the way to the final response. I will present a method, time continuous multiple regression (TCMR), that extracts dynamic markers for the different sub-processes leading to a response. From these dynamic markers, the method extracts information about the timing, the duration, and the strength of the influence of the different sub-processes. I will present results on the psychometric properties of these dynamic markers, i.e. reliability and validity. Furthermore, I will illustrate how these dynamic markers can further be applied in group-level studies, e.g. on differences between the Flanker and the Simon task. All analyses presented can be performed with the TCMR Matlab toolbox that is provided for download (osf.io/5e3vn).

Combining the post-cue task and the perceptual identification task to investigate parallel activation and mutual facilitation in semantic priming

Demian Scherer[1] & Dirk Wentura[2]
[1]University of Münster, Department of Psychology; [2]Saarland University, Department of Psychology
demian.scherer@uni-muenster.de

Recent theories suggest that semantically similar concepts mutually facilitate their activation when they are concurrently active. We investigated this claim using semantic priming. More precisely, in two experiments, a perceptual identification task was employed. Prime-target pairs were briefly presented and masked, with a stimulus onset asynchrony of 0 ms. A cue defined which of two simultaneously presented words was the target. Participants were instructed to identify the target. In Experiment 1, the target-defining-cue was presented at stimulus onset, while in Experiment 2 the cue was not presented before the offset of the stimuli. Thus, in Experiment 2, a post-cue task was combined with the perceptual identification task. We obtained significant semantic priming effects in both experiments. This result is compatible with the view that two concepts can both be activated in parallel and can mutually facilitate each other when they are semantically related. A potential link of this assumption to working memory research will be discussed.

Kontaktanaloges Distanz-Tachometer - Auswirkungen auf das Situationsbewusstsein, die Geschwindigkeitsregulierung und die Arbeitsbelastung

Frederik Schewe & Mark Vollrath
Technische Universität Braunschweig, Institut für Psychologie, Ingenieur- und Verkehrspsychologie
f.schewe@tu-braunschweig.de

Abstract: Die von dem Fahrer gewählte Geschwindigkeit ist aufgrund ihrer Auswirkungen auf die Sicherheit und Effizienz ein wesentlicher Faktor des Straßenverkehrs. Durch den technischen Fortschritt ergeben sich neue Möglichkeiten der Geschwindigkeitsbeeinflussung. Basierend auf Car2X-Kommunikation können dezentrale Prozesse sowie das zentrale Verkehrsmanagement kontinuierlich die optimale Geschwindigkeit für einzelne Fahrzeuge ermitteln und vorgeben. Zu diesem Zweck wurde eine Anzeige entwickelt, bei der Distanzen in einem Head-Up-Display kontaktanalog visualisiert werden, um so die Geschwindigkeit darzustellen. Es wurde eine experimentelle Fahrsimulatorstudie (n = 52) durchgeführt, bei der das Kontaktanaloge Distanz-Tachometer mit einer herkömmlichen Tacho-Anzeige verglichen wurde. Beide Gruppen fuhren mehrfach Szenarien in einer Folgefahrt und einer freien Fahrt mit unterschiedlichen Geschwindigkeitsbegrenzungen. Als wesentliche abhänge Variablen wurden die mittlere Geschwindigkeit in der freien Fahrt und der mittlere Abstand in der Folgefahrt gemessen, um damit die Eignung des neuen Displays zur Regulation der Geschwindigkeit zu prüfen. Ein weiteres Experiment ist geplant, um zu prüfen, in welchem Umfang das Kontaktanaloge Distanz-Tachometer die Geschwindigkeitswahl in einem kooperativen Verkehrsraum beeinflussen kann.

Tinted lenses affect our physiological responses to affective pictures: An EEG/ERP study

Tim Schilling[1], Siegfried Wahl[2] & Lewis Chuang[3]
[1]University of Tübingen, Institute for Ophthalmic Research; Department of Perception, Cognition and Action, Max Planck Institute for Biological Cybernetics; [2]University of Tübingen, Institute for Ophthalmic Research; Carl Zeiss Vision International GmbH; [3]Department of Perception, Cognition and Action, Max Planck Institute for Biological Cybernetics
tim-tobias.schilling@uni-tuebingen.de

Colors can have an influence on the emotional processing of affective stimuli. In this work, we investigate if the emotional processing of images from the International-Affective-Picture-System (IAPS; Lang et al., 2008) are modulated when experienced through tinted lenses. The experiment (N=20) presented IAPS images (Valence: neutral, pleasant, unpleasant) for a duration of 3s and participants wore tinted lenses (Tint: none, Blue, Red, Yellow, Green). During image presentation, we measured EEG/ERP and Skin-Conductance-Response (SCR). We found that phasic SCR was significantly diminished with Red. In the EEG, we observed an ERP component that differentiated for the factors of Valence and Tint, which was similar to the late-positive-potential (i.e., LPP; 500-1500ms; FCz). An ANOVA of the mean voltage potential returned significant main effects for Valence ($F(2,38)=15.0$, $p<.05$, $\omega^2=.41$) and Tint ($F(4,76)=3.46$, $p<.05$, $\omega^2=.11$) and their interaction ($F(8,152)=2.12$, $p<.05$, $\omega^2=.05$). With neutral images, yellow tinted lens resulted in largest LPP compared to none. With pleasant and unpleasant images, red tinted lens diminished the LPP response relative to none. To conclude, red tinted lenses appear to suppress an arousal response to high valence images. Interestingly, individuals with meditation experience have similarly been reported to reduce LPP responses to negative images (Sobolewski et al., 2011).

When positive and negative is not the same: Evaluation of emotional words using event-related potentials

Sebastian Schindler
Ghent University; Bielefeld University
sebastian.schindler@uni-bielefeld.de

Studies on affective language processing show that, compared to neutral words, emotional words are characterized by amplifications of certain emotion-related ERP components: The Early Posterior Negativity (EPN) and the Late Positive Potential (LPP). However, although we can easily distinguish between negative and positive words, their ERP amplitude pattern is typically highly similar. To characterize under which circumstances ERPs can be distinguished between positive and negative words, two EEG experiments were performed. In a first experiment, participants were asked to either passively watch negative and positive words or evaluate (i.e. classify) these words. While no differences were found in the passive viewing condition, the word evaluation task revealed a lateralization for valencein the LPP. Here, larger LPP amplitudes were found for negative words over left and positive words over right sensors. In the second experiment, participants were tested in a pseudo-interactive scenario. They could accept or reject evaluative feedback based on single adjectives, putatively sent from another participant. Results showed a substantial increase in LPP amplitudes for positive words, which was even present one week after initial testing. Thus, communicative context as well as task-demands modulate valence specific word processing, suggesting that ERPs can distinguish between emotional valence.

Reward magnitude influences decision accuracy and stimulus generalization in multi-attribute categorization

René Schlegelmilch & Bettina von Helversen
University of Zurich
r.schlegelmilch@psychologie.uzh.ch

Task reward has been shown to affect memory and generalization in several tasks, but whether reward magnitude influences category learning is unclear. In the current project we examine how differences in reward magnitude affect categorization decisions. We investigate the underlying relationship between reward magnitude and memory representations by testing two mechanisms within the framework of exemplar models. Specifically, we test whether reward influences (1) memory strength, i.e. the accessibility of exemplars in memory, and (2) exemplar generalization, i.e. differences in the perceived similarity to novel items, which are two parameters in the generalized context model (GCM, Nosofsky, 2011). We present two studies addressing these open questions. In both studies, participants first underwent a category learning phase. Correct categorizations yielded different rewards for specific exemplars (high vs. low). A test phase followed, including novel stimuli. Overall, introducing differences in reward magnitude reliably decreased accuracy for low reward exemplars during category learning, without increasing accuracy for high reward exemplars. Using a Bayesian hierarchical approach, we modeled categorizations in the test phase with the GCM. The evidence suggests, that novel decisions are more sensitive to high than to low reward exemplars. Reward magnitude therefore relates to generalization, but not memory strength.

Visual mismatch negativity under inattentional blindness in a roving oddball paradigm

Insa Schloßmacher, Maximilian Bruchmann & Thomas Straube
University of Münster, Institute of Medical Psychology and Systems Neuroscience
insa.schlossmacher@uni-muenster.de

The existence of a visual counterpart of auditory mismatch negativity has been established in numerous studies in the last decades. However, several open questions about modulatory influences of awareness and task demands on visual mismatch negativity (vMMN) still remain. Here, a roving oddball paradigm with varying stimulus repetitions was used in order to elicit vMMN between the first (deviant) and fourth (standard) stimulus. Geometrical shapes made from line segments (i.e. squares & rectangles) were presented together with a demanding foreground task based on Pitts, Martínez, and Hillyard (2011). Electrophysiological responses were obtained in three physically identical phases that differed only with respect to the subject's instructions: subjects (1) were uninformed about the shapes and attended the foreground task (inattentional blind) (2) were informed about the shapes but still attended the foreground task (3) attended the shapes. In phase 1 we obtained evidence for vMMN elicitation when subjects were inattentional blind. Furthermore, vMMN was clearly modulated by task demands leading to a stronger vMMN in phase 3 compared to phase 2. Taken together results show that vMMN can be elicited without conscious perception of stimuli, but is susceptible to task demands.

Investigating emotion-induced retrograde and anterograde memory effects in sequences of related and unrelated words

Helge Schlüter & Christina Bermeitinger
University of Hildesheim, Department of General Psychology
helge.schlueter@uni-hildesheim.de

It is of the utmost importance for an organism to rapidly detect and react to changes in its environment. The emotional oddball paradigm (EOP) has been repeatedly used to investigate the special role of emotional content in change detection. It has also proven useful in tapping emotion-induced memory effects by using emotional oddballs in a stream of neutral standard information. The present study aimed to reveal potential differential effects of oddball valence (negative, neutral, or positive) on the free recall performance of neighboring standard words. Furthermore, the semantic relatedness of the word lists was manipulated within two versions of an experiment. While oddball effects of negative emotion were observed in both versions, effects on stimuli preceding an oddball (retrograde effects) and effects on stimuli following an oddball (anterograde effects) did not reach significance. Results are additionally discussed in the light of general methodological issues of the research on emotion-induced retrograde and anterograde amnesic (detrimental)/hypermnesic (enhancing) effects.

Inferring causal history from shape

Filipp Schmidt & Roland W. Fleming
Justus Liebig University Giessen, Experimental Psychology
filipp.schmidt@psychol.uni-giessen.de

Every object in our environment has its shape due to some kind of generative process, such as manufacture or biological growth. There is very little research on if and how we perceive and infer this causal history from current object shape. To investigate this inference, we took photos of objects from six different materials ("wax", "aluminium foil", "gold foil", "chicken wire", "putty", "cardboard") transformed by one of four different transformations ("folded", "bent", "crumpled", "twisted"). By varying details of transformation, arrangement and viewpoint, we obtained 30 shots of each material/transformation combination (720 images). We asked different groups of participants to (1) name transformations and materials, (2) classify each image into the four given transformation classes, and to (3) rate each image with respect to the extent the object was transformed by each of the four transformations. Our results show that participants can infer transformations from object shape-with accuracy being modulated by object material. This inference of causal history from current object shape is only possible if we can distinguish between intrinsic (material) and extrinsic (transformation) properties of the object. This separation of observed shape features by their causal origin (shape scission) presumably involves both perceptual and cognitive abilities.

An Episodic Memory Account of Cued Task Switching

James R. Schmidt, Baptist Liefooghe & Jan De Houwer
Ghent University
james.schmidt@ugent.be

In this talk, it is shown how the latest version of the Parallel Episodic Processing (PEP) model can simulate a range of findings from the cued task switching literature. In cued task switching, participants respond to a target stimulus (e.g., "9") by executing one of two tasks (e.g., parity or magnitude decisions) on the basis of a task cue. The switch cost is the finding that performance is hindered when the task alternates rather than repeats from that executed on the previous trial. Though often interpreted in terms of higher-order control processes (e.g., task set reconfiguration), it has be argued that the bulk of the switch cost is probably due to episodic biases (e.g., cue repetition benefits and stimulus-response bindings). In the present simulations, an episodic memory model produces not only the switch cost, but but also a range of other benchmark findings and novel predictions. In our episodic framework, most of these findings result from feature integration (binding) biases and have little or nothing to do with the switching of the task itself. Given the parsimony and unique explanatory power of the episodic account presented here, our results suggest that competing cognitive control accounts might be needlessly complex.

Situation Modification in Conflict Tasks

Constantin Schmidts
Julius Maximilians Universität, Department of Psychology
constantin.schmidts@uni-wuerzburg.de

Humans cope with cognitive conflict in various ways, such as focusing on task-relevant instead of task-irrelevant information or avoiding situations where conflict is likely. These adaptations to conflict resemble those used to cope with negative affect. We examined whether situation modification, a strategy derived from the extended process model of emotion regulation, may influence responding in cognitive conflict tasks. This should be evident by a facilitation of actions that consistently modify situations towards congruent (positive) situations rather than to incongruent (negative) situations. In four experiments, participants modified stimuli in a color-word Stroop task towards congruent or incongruent stimuli of (un)predictable identity. A modification effect emerged, insofar as participants were faster when they foreseeably produced congruent stimuli of predictable identity than when they produced incongruent stimuli or stimuli of unpredictable identity. Our results add to the body of evidence connecting affect and cognitive conflict, and reveal a constraint when using situation modification as a means to regulate cognitive conflict.

Individual Differences in Post-Error Slowing

Florian Schmitz[1], Doris Keye[2], Klaus Oberauer[3] & Oliver Wilhelm[4]
[1]Universität Duisburg-Essen; [2]DLR Hamburg; [3]University of Zürich; [4]Ulm University
florian.schmitz@uni-due.de

Error-related processes are considered relevant markers of working memory functioning, with post error slowing (PES) as the most prominent behavioral indicator. Accounts of PES emphasize both cognitive (e.g., biasing task-demand units and other control processes) as well as non-cognitive factors (e.g., an increase in response caution). PES may therefore reflect a multitude of underlying processes and is currently poorly understood from an individual differences perspective. In the current study, 140 research participants completed an Eriksen and a Flanker paradigm with 1400 trials each. Additionally, the battery comprised indicators of working memory capacity (WMC) and different facets of self-reported impulsivity. Response time data were modeled with bifactor CFA, with baseline speed as a general factor in each task, and response-conflict and PES as nested specific factors. Replicating previous findings, response-conflict specific variance extracted in both conflict paradigms was not correlated. However, there was a moderate relationship of PES across tasks, offering some evidence of individual differences in PES. Yet, PES was independent of WMC and self-reported impulsivity. Diffusion model analyses suggest that individual differences in PES reflect, in particular, increased response caution and increased non-decision time after committing an error.

Pragmatic Processing: An Experimental Investigation of Presuppositions Triggered By Definite Articles

Cosima Schneider[1], Michael Franke[2], Carolin Schonard[3], Gerhard Jäger[2] & Markus Janczyk[1]
[1]University of Tübingen, Department of Psychology; [2]University of Tübingen, Institute of Linguistics; [3]TU Chemnitz
cosima.schneider@uni-tuebingen.de

A presupposition (PSP) is a condition that has to be met in order for a linguistic expression to be appropriate. Certain linguistic expressions routinely trigger appropriateness conditions/PSPs. The definite article is one PSP trigger and it creates the (uniqueness) PSP: For example, if in a given context there are two bananas and one pear, it is felicitous to utter: "Give me the pear", but the appropriate condition is violated when the speaker says "Give me the banana". In this study we investigate the processing of PSPs using mouse-tracking in a verification task. This setup allows to compare the processing of sentences with definite and indefinite articles in pragmatically felicitous and infelicitous contexts, and to gain insight into the temporal dynamics of this processing. The data show that PSP processing is context dependent: Sentences with infelicitous definite articles interpreted in the global context require additional processing time. In sum, our study is the first attempt to provide mouse-tracking data for PSP processing and it gives insights into the temporal processing of PSPs triggered by the definite article.

Changing working memory states by means of retroactive cues: What can lateralized effects in the EEG tell us?

Daniel Schneider, Anna Barth, Laura-Isabelle Klatt & Edmund Wascher
Leibniz Research Centre for Working Environment and Human Factors
schneiderd@ifado.de

Attentional shifts based on retroactive cues (retro-cues) facilitate performance in working memory (WM) tasks. This retro-cue benefit is related to the concentration of WM resources on a subset of representations at the cost of non-cued items. However, the attentional mechanisms underlying this process are still largely unexplained. Given this, we applied delayed estimation WM tasks and measured lateralized effects in the EEG following retro-cues to either left- or right-lateralized memory items. Retro-cues elicited an early posterior contralateral negativity (PCN), an anterior directing attention negativity (ADAN) and a posterior contralateral suppression in alpha power, indicating transient attentional shifts toward the cued information. We further concentrated on contralateral delay activity (CDA) as an indicator for the active storage of information in visuo-spatial WM. Modulations of CDA have been only infrequently associated with retroactive attentional orienting. We show that these ambiguous findings might be due to the fact that a retro-cue related modulation of the CDA is reduced to trials with a highly accurate response. Thus, not only the selection of cued contents and their transfer into a higher-level (e.g., response-related) state, but also the selective storage of information in the form of visuo-spatial representations constitutes the retro-cue benefit in WM tasks.

Controlling statistical decision errors with minimal costs: Relative efficiency of sequential probability ratio t-tests vs. Bayesian t-tests

Martin Schnuerch & Edgar Erdfelder
University of Mannheim, Department of Psychology
martin.schnuerch@psychologie.uni-mannheim.de

Neyman and Pearson's statistical decision theory represents the normative standard for most statistical tests in psychological research nowadays. A crucial feature of this theory is the a priori determination of sample sizes, often resulting in large required samples. To minimize costs, researchers frequently violate this principle by recursively applying significance tests and stopping the sampling process whenever a "significant" (i.e., $p < .05$) outcome is observed. However, this practice boosts the risk of decision errors. Sequential tests provide an attractive alternative to classical procedures as they are designed to control these errors in a time- and cost-efficient manner. Recently, Schönbrodt, Wagenmakers, Zehetleitner, and Perugini (2017) proposed Sequential Bayes Factors (SBF) as a method to increase efficiency in testing mean differences. We argue that Sequential Probability Ratio Tests (SPRT) proposed by Wald (1945) not only typically require smaller samples than SBF to achieve the same accuracy but also control predetermined error probabilities in the long run. We introduce a simple procedure that implements SPRT for a sequential t-test in R, compare it to SBF by means of simulation, and show that the SPRT procedure has optimal properties for a wide range of population scenarios.

Validate mouse tracking: How design factors influence action dynamics in intertemporal decision making

Martin Schoemann[1], Malte Lüken[1], Tobias Grage[1], Pascal J. Kieslich[2] & Stefan Scherbaum[1]
[1]Technische Universität Dresden, Department of Psychology; [2]University of Mannheim, Department of Psychology
martin.schoemann@tu-dresden.de

Mouse-tracking as process-tracing method builds on the assumption that the continuity of mind leaks into the continuity of movements. Given this assumption, it is an important question whether the assumed interaction between mind and movement might be influenced by the measurement itself, that is, design factors of the of mouse-tracking procedure. Hence, we conducted two mouse-tracking studies (N=40 each) in which we systematically investigated the influence of design factors on the quality of mouse-tracking measures, and hence, the reported effects. We used a mouse-tracking version of a classical intertemporal choice task that has previously been used to examine the dynamics of temporal discounting and the date-delay effect (Dshemuchadse, Scherbaum, & Goschke, 2013). Between studies, we varied the starting procedure. Within studies and between participants, we varied the response procedure. Within studies and within participants, we varied the stimuli location. Our results suggest that design factors influence the interaction between mind and movement and therefore have impact on mouse-tracking measures, the reported effects, and eventually, the validity of mouse-tracking as process-tracing method.

The influence of attitudes and knowledge on the continued influence effect

Sebastian Scholz, Thorsten Finke & Stephan Dutke
University of Münster, Department of Psychology
sebastian.scholz@uni-muenster.de

Research demonstrated that corrected misinformation continues to influence memory. We hypothesized that this effect would be attenuated by extended knowledge about and positive attitudes toward the misinformation. In an online experiment, participants (N = 216) completed questionnaires regarding preexisting attitudes and knowledge about genetically modified food and then received written statements dealing with this topic. One of these statements was later corrected for half of the participants. All participants were then asked to make continuative inferences about these statements. We were interested in whether a correction would induce participants to update their memory of the statements and make fewer references to the misinformation. In accordance with prior studies, we found that a correction decreased but didn't eliminate the continued influence of misinformation. Positive attitudes towards the topic led to fewer references to the misinformation but didn't interact with the correction. Knowledge about the topic, however, did neither influence the processing of misinformation nor the impact of the correction. These results are in line with a mental model explanation of the continued influence effect and discussed in the context of attitude congruent memory. Overall, the continuing influence of misinformation despite correction can have potential consequences for everyday life.

The Vertical Dimension and Viewing Angle in the Perception of Artworks and Faces

Lars-Michael Schöpper[1] & Helmut Leder[2]
[1]University of Trier, Department of Psychology; [2]University of Vienna, Department of Basic Psychological Research and Research Methods
lars-michael.schoepper@univie.ac.at

Research on metaphors and embodiment suggests a conceptual link between affect and the vertical dimension, which can be summarized as "positive = up" and "negative = down". We investigated, if emotionally valent artworks are liked more when hanging congruent with the metaphorical concept, respectively looking up or down to them. Building up on previous research, we also investigated if looking up to male faces and looking down to female faces makes them appear more attractive, resulting from an average height difference between men and women. We assumed an interaction with participant's sex, viewing angle and stimulus' sex. Participants rated printed artworks and faces, which were hung in low and high positions in a room. We calculated the viewing angle by subtracting the height of each image from the eye height of every participant. For the category of faces, we found no effect of viewing angle. For the category of artworks, we found a rather unexpected effect of viewing angle, in that looking down at artworks increased their perceived quality. In exploratory analyses, we found interactions of height difference with valence (and other factors), some of which were incongruent with the metaphorical concept. Results suggest alternative consequences of head tilt.

Less is more! Cross-modal Effects of Music Event Rate on Product Perceptions

Robert Schorn[1], Alexandra Brunner-Sperdin[2] & Dagmar Abfalter[3]
[1]UMIT - University for Health Sciences, Medical Informatics and Technology, Institute of Psychology; [2]University of Applied Sciences, Kufstein; [3]University of Music and Performing Arts
robert.schorn@umit.at

An increasing number of customers are choosing to order their products online. Customers inevitably make inferences on size when they consider a product presented online. Previous studies have shown that structural differences in background music can influence customers' perceptions of product attributes through cross-modal inference. Relating to cross-modal effects we propose that the event rate (number of notes per beat) has an influence on consumers' perceptions of product size. We conducted a 2 (music mode: major vs. minor) x 2 (music tempo: slow vs. fast) x 2 (notes per beat: two vs. four) between-subjects experimental design. Dependent variables were participants' estimates regarding the size of food (picture of burger, pizza, wine bottle). The outcomes of this study suggest that music with a lower event rate creates a bigger mental image of the product and consequently creates a larger incentive to purchase food items. An adverse effect may be true for electronic apparel, where smaller is considered better.

If you always tell the truth you don't have to remember anything: New insights into the implicit memory of lying

Franziska Annett Schreckenbach, Klaus Rothermund & Nicolas Koranyi
Friedrich-Schiller University Jena, Department of General Psychology II
franziska.schreckenbach@uni-jena.de

Nowadays, it is commonly known that we often use lies to form our social interactions in a positive way, but if we are detected, social exclusion can be the consequence. This is why everyone knows that a liar should have a good memory, as it is important to remember the lies we told. Accordingly, knowledge about having lied has been shown to be retrieved automatically when one reencounters the same question that one has lied to before (Koranyi, Schreckenbach, & Rothermund, 2015). After a similar mechanism has been observed for pictures of persons (Schreckenbach, Rothermund, & Koranyi, submitted), the question arose whether a combination of these cues would produce similar effects. In the present experiment participants were orally interviewed and had to lie to one of two different topics. Subsequently, they completed a categorization task in which the words "honest" and "dishonest" had to be classified, while pictures and questions in combination were used as task-irrelevant primes. In line with our assumptions, automatic retrieval was found after the presentation of a question that one has lied to in combination with the picture of the interviewer, whereas no effect emerged after the presentation of truthful questions or an unknown person.

Acceptance of Mobile EEG-Devices

Friederice Schröder[1] & Thea Radüntz[2]
[1]Technische Universität Berlin, Department of Psychology and Ergonomics, Chair of Cognitive Psychology and Cognitive Ergonomics; [2]Federal Institute for Occupational Safety and Health, Unit 3.4 - Mental Health and Cognitive Capacity
friederice.schroeder@tu-berlin.de

Using traditional EEG-systems outside a laboratory reveals many limitations. Mobile EEG-systems can compensate many of the traditional EEG disadvantages. Their future use in research depends on several factors. One important concern relates to the participants' acceptance of mobile EEG-devices. In this study 24 participants experienced seven mobile EEG-devices on seven consecutive days. They performed a number of paired comparisons and ranked the systems regarding comfort and appearance to find the best mobile EEG-device. In addition, they performed a cross-modality-matching-task while wearing the EEG-devices, to control for memory-effects. For that, they had to describe the discomfort of the devices and their current affective condition by pressing a hand dynamometer. The Emotiv EPOC-system (with a flexible design and saline based wet sensors) was favored by most of the participants in the paired comparisons. Consistently, EPOC was favored regarding comfort and appearance in the ranking procedure too. Finally, the cross-modality-matching showed similar results. We conclude that comfort and appearance have an influence on the participants' acceptance of mobile EEG-devices. However, further research is needed to finally evaluate the advantages of mobile EEG-devices over traditional systems, e.g. regarding the signal quality, which is part of an additional study.

The development of eye-movements when learning to read in a new orthography

Sascha Schroeder, Simon P. Tiffin-Richards & Katharina Pittrich
Max Planck Institute for Human Development MPRG REaD (Reading Education and Development)
sascha.schroeder@mpib-berlin.mpg.de

In this study, we investigated the development of adults' eye-movements when they learn to read in a new orthography. Ten participants learned to read simple German sentences which were, however, written using Greek letters. Some letters (e.g., M) were written identical in both scripts, some (e.g., a) were visually similar, and some (e.g., h) were different in both scripts. Subjects participated in nine sessions which were separated by one week. In each session, their eye-movements were recorded. in addition, their reading behavior for unchanged, normally presented items in the first and last session. Moreover, we are able to compare their performance to children's eye-movements in grades 2-4 reading the same sentences in unchanged script. Results showed that adults' initial performance on reading sentences in the new orthography in the first session was very similar to 2nd graders reading the same sentences in standard script. Adults constantly adapted to the new script and their learning curve followed a power law distribution. Reading times for sentences decreased. This effect is mainly driven by a decrease of refixations and regressions. We discuss our results in regard to current models of eye-movement development.

The impact of hypertext presentation on readers' attention and text comprehension

Torsten Schubert[1], Teresa Ronja Schurer[2] & Bertram Opitz[2]
[1]Martin-Luther-Universität Halle-Wittenberg, Institut für Psychologie; [2]Martin-Luther-Universität Halle-Wittenberg, Zentrum für multimediales Lehren und Lernen
teresa.schurer@llz.uni-halle.de

E-Learning has become increasingly popular and reading digital texts is a common practice for many people. Prior studies showed that the coherence of a text can influence text comprehensibility with low degrees of coherence causing attention failures and difficulties for the construction of a mental model from the text. Importantly, in hypertexts the use of embedded links represents an additional source, which can affect the efficiency of cognitive processing during reading. In particular, the use of the links can influence the comprehension process by redirecting reader`s attention and by interrupting the construction of a mental model from the text. Here, we investigated how the degree of coherence and the need to use hyperlinks affect reader's attention and the efficiency of text comprehension. Attention of readers was tested by counting Mind Wandering (MW) episodes by asking readers to judge about their current thought contents during unexpected MW probes. Text comprehension was investigated by presenting special questions about text content after reading. Results showed that MW episodes were less frequent when participants read the coherent hypertext version. In addition, participants showed better comprehension performance under conditions of high coherence texts. These findings provide insights into processing attention during reading online texts.

Applying the diffusion model to research on cognitive control

Stefanie Schuch
RWTH Aachen University, Institute of Psychology
schuch@psych.rwth-aachen.de

Cognitive control refers to processes facilitating goal-directed behavior. One empirical tool to investigate cognitive control is the task-switching paradigm, where the ability to flexibly switch between different goals is explored. In this talk, I will present some examples of how diffusion modeling of reaction-time data can help to better understand task-switching processes. I will focus on N-2 task repetition costs, which denote the performance difference between task sequences of types ABA (returning to a task after one intermediate trial) and CBA (returning after two or more intermediate trials). I will also discuss the aftereffect of N-2 task repetition trials: Performance is facilitated after ABA, relative to after CBA, which is called the N-3 effect. The results can be summarized as follows: N-2 task repetition costs are mainly reflected in the drift rate parameter, suggesting that task interference is related to noisier task representations. The N-3 effect so far could not be associated with one particular diffusion model parameter. The task-preparation interval was manipulated in order to assess whether the N-3 effect is related to task-specific preparation processes. The results clearly show that it is not. These examples demonstrate that diffusion modeling can be a useful tool for task-switching researchers.

The influence of lexicon size and font characteristics on information optimization in reading: an orthographic prediction model investigation

Simon Schug[1], Christian J. Fiebach[2] & Benjamin Gagl[3]
[1]Department of Psychology, Goethe University Frankfurt; [2]Department of Psychology, Goethe University Frankfurt; Center for Individual Development and Adaptive Education of Children at Risk (IDeA); Interdisciplinary Center for Neuroscience Frankfurt; [3]Department of Psychology, Goethe University Frankfurt; Center for Individual Development and Adaptive Education of Children at Risk (IDeA)
gagl@psych.uni-frankfurt.de

Neurophysiology suggests energy-efficient visual processes during reading. Taking this constraint into account, we developed and evaluated an orthographic prediction model of reading according to which redundant perceptual input is "explained away" so that subsequent stages of word recognition are based on an optimized representation: the orthographic prediction error (oPE). Here we investigate the dependency of model performance (i.e., the precision of orthographic precisions) on the size of the lexicon and font type used for the redundancy calculation in the model implementation. Both investigations were performed using linear mixed models fitting reaction times from a lexical decision task (35 participants; 1,600 stimuli; presented in monospaced Courier New font). We examined model fit in multiple implementations based on systematic parameterizations of lexicon size and font type. Lexicon sizes below 500 words resulted in an exponential increase of model fits, while leveling out for larger lexicon sizes. For the fonts comparison, best model fit was found for the presented font (Courier New) and a systematic decrease from fonts with comparable (i.e. other monospaced) to dissimilar (i.e. proportionally-spaced) characteristics. Thus, top-down prediction-based information optimization during visual word recognition depends on visual characteristics and lexicon size.

Blind Haste: As Light Decreases, Speeding Increases

Michael Schulte-Mecklenbeck[1] & Emanuel DeBellis[2]
[1]University of Bern; Max Planck Institute for Human Development; [2]University of St. Gallen
michael@schulte-mecklenbeck.com

Traffic accidents are frequently attributed to speeding, with properties of the individual driver and the environment regarded as key contributing factors. Driving simulation studies showed that the quality of visual conditions affects drivers' speed perception and their driving speed. One set of findings suggests that drivers underestimate their speed when driving under adverse visual conditions (e.g., in fog) and therefore accelerate; other research has observed a decrease in driving speed under such conditions. Here we examine drivers' real-world speeding behavior and its interaction with illuminance, a ubiquitous environmental property defined as the luminous flux incident on a surface. Drawing on an analysis of 1.2 million vehicle movements, we show that reduced illuminance levels are associated with an increase in speeding. Traffic planners can act on the inverse illuminance/speeding relationship by testing the extent to which improved street lighting can attenuate speeding and the associated accident rates.

Paying to seek or avoid social interactions

Johannes Schultz, Tom Willems, Ghada Chakkour, Alexander Franke & René Hurlemann
University of Bonn, Division of Medical Psychology
johannes.schultz@ukbonn.de

Interacting with other people is a major source of happiness for most humans. However, social interactions may result in negative social feedback. While many people spend money to seek social interactions, socially anxious individuals may instead tend to avoid social interactions, resulting in a loss of private and professional opportunities. To quantify the costs of pro-sociality and social anxiety, we devised a task allowing to determine how much money participants spend to avoid or seek a simple social interaction with a human opponent. In a sample of healthy participants, the more anxious participants paid to avoid the interaction, while the less anxious paid to seek the interaction. These differences were not found in a control condition with a computer as interaction partner, demonstrating that risk aversion differences cannot explain our findings. Valence ratings of the interaction outcomes did not significantly vary between participant groups, suggesting that differences in outcomes valuation cannot explain the observed effects. Our results demonstrate that tendencies towards pro-sociality and social anxiety among healthy participants are both costly. Our experiment allows to quantify the costs of these traits and may prove useful for quantifying social anxiety and probing the neural correlates of social decision-making.

Making inferences from bets: What would a Bayesian do?

Christin Schulze & Timothy J. Pleskac
Max Planck Institute for Human Development, Center for Adaptive Rationality
cschulze@mpib-berlin.mpg.de

If you know it has been 5 minutes since the last bus came past your stop, how much longer do you think you will have to wait for the next one? What if a friend at the stop offered you the following bet: For the cost of 1€ he will pay you 10€, if the next bus takes more than 10 minutes to arrive? Should and does the mere proposal of the bet alter your beliefs about when the next bus will arrive? Prior research suggests that people's every predictions approximate optimal Bayesian inference in solitary settings. We develop a Bayesian belief-updating model for making inferences from bets in social contexts, which captures how people change their beliefs based on information carried in bets they are offered. The model assumes that, in environments in which risks and rewards are inversely related, a bet is datum that signals the bet-upon event. We test the predictions of this model in an experiment that asks people to judge the duration and extent of everyday phenomena. We find that the signal carried in a bet influences people's personal beliefs. These results provide novel insight into how people use risk-reward relationships in social contexts.

Hemispheric lateralisation does not affect motor planning in a sequential reaching task

Christoph Schütz & Thomas Schack
Bielefeld University, Cluster of Excellence Cognitive Interaction Technology (CITEC)
christoph.schuetz@uni-bielefeld.de

In sequential reaching tasks, people persist on their former postures. The size of this hysteresis effect is a proxy for motor planning. The cost-optimisation hypothesis predicts that the fraction of novel planning is affected by the cognitive and the mechanical cost of the task. According to theories, the cognitive cost of motor planning is lower in the left hemisphere, whereas the mechanical cost of motor execution is lower in the dominant hand. We asked whether hysteresis effect sizes differed between left- and right-handed dominant participants. To this end, we designed a sequential reaching task. Left- and right-handed participants had to open a column of drawers with cylindrical knobs in ascending/descending sequences, using either their left or right hand. Hand pro/supination was measured as the dependent variable. Results showed a significant interaction of 'hand' × 'handedness', $F(1,44) = 5.457$, $p = .024$. Only the left-handed dominant participants used different postures in their left and right hand, $F(1,21) = 6.956$, $p = .015$. More importantly, there was no significant interaction of 'hand' × 'sequence' × 'handedness', $F(1,44) < 1$. This indicates that the size of the hysteresis effect and, thus, the fraction of novel planning, was not affected by hemispheric lateralisation.

Learning opposing visuomotor rotations in a single visuomotor map

Raphael Schween[1], Jordan A Taylor[2] & Mathias Hegele[1]
[1]Justus-Liebig-University, Department of Psychology and Sport Science, Neuromotor Behavior Laboratory; [2]Princeton University, Department of Psychology, Intelligent Performance and Adaptation Laboratory
raphael.schween@sport.uni-giessen.de

People can easily switch between operating tools with very different properties. This capacity has been investigated by studying how well individuals can learn to overcome two opposing visuomotor perturbations, in close succession. When observed, dual learning has been viewed as reflecting the formation and adaptation of separate visuomotor maps. Here, we examined this idea in a visuomotor rotation task and, instead, find that dual learning is supported by local adaptation of a single visuomotor map. Participants reached repeatedly towards a target at 90° in separate visual workspaces while training to overcome opposing 45° visuomotor rotations, where the sign of the rotation was tied to each workspace. Generalization of aftereffects was tested at targets from 0-180°, in the absence of the rotations. Aftereffects did not differ by visual workspace. Instead, aftereffects for both workspaces displayed generalization patterns with two opposite peaks at 45° and 112.5°. The direction and location of the peaks could be explained by generalization of aftereffects that center on the intended aim rather than visual target[1]. Our results suggest that previous reports of dual adaptation may reflect local changes in a single visuomotor map, rather than the formation of two separate maps. [1]Day et al. 2016. eNeuro 3(2):e0005-16.2016

Längsschnittliche Analyse von Jugendlichen zu Ihren Einstellungen zum Fahren und zur Automobilität

Benedikt Schweer[1], Birgit Erdwien[2], Guido Kattert[1], Heinz Albert Stumpen[1] & Christine Sutter[1]
[1]Deutsche Hochschule der Polizei, Fachgebiet II.4 Verkehrswissenschaft & Verkehrspsychologie; [2]Erdwien Consulting
benedikt.schweer@dhpol.de

Aufbauend auf einer querschnittliche Untersuchung wurde über einen Zeitraum von weiteren drei Jahren eine längsschnittliche Analyse durchgeführt, zu der 1.108 Fragebögen ausgewertet wurden. Diese untersuchte die Einstellung von Jugendlichen zum Fahren und zur Automobilität. Die Studie hat die Annahme bestätigt, dass sich bereits im Jugendalter Einstellungsmuster zeigen, die auf ein divergierendes Risikopotenzial hindeuten und somit ein konkretes Jugendlichkeitsrisiko nachweisen können, welches sich vom Anfängerrisiko abgrenzt. Es konnte aufgezeigt werden, dass sich über alle Erhebungszeiträume hinweg drei Gruppen von Jugendlichen herausbilden, welche ein hohes, ein mittleres und eine geringes Potenzial aufweisen, später als Risikofahrer aufzufallen. Die Studie konnte darüber hinaus für die Überprüfung der Annahme, dass sich risikobezogene Einstellungsmuster im Zeitverlauf manifestieren, zwei wesentliche Punkte statistisch signifikant belegen: zum einen existieren Gruppen von Jugendlichen, die stabil über alle Zeiträume das gleiche Risikopotenzial aufweisen. Zum anderen existiert mit den Switchern eine Gruppe von Jugendlichen, die sich mit ihren Einstellungen und Werten noch in der Entwicklung befinden und sich noch nicht in einem abschließenden Risikobereich festgelegt haben. Die Erkenntnisse zeigen auf, das Interventionsmaßnahmen nicht erst zum Zeitpunkt des Führerscheinerwerbs, sondern bereits vorher notwendig erscheinen um das Verhalten von potentiellen Risikofahrern nachhaltig positiv zu beeinflussen.

Do irrelevant conceptual features automatically trigger crossmodal response retrieval?

Julien Schweitzer[1], Ann-Katrin Wesslein[2] & Friedrich W. Hesse[1]
[1]Leibniz-Institut für Wissensmedien Tübingen; [2]University of Tübingen
j.schweitzer@iwm-tuebingen.de

Distractor repetition can trigger the retrieval of earlier responses, even when the distractor is presented to a different sensory modality. Evidence for such a binding of responses to conceptual distractors comes from experiments using identification tasks where the same conceptual feature (i.e., stimulus identity) serves as (a) the relevant stimulus feature and (b) the distractor feature. Note that this demonstrates distractor-response bindings for a conceptual dimension under conditions where the conceptual dimension is task-relevant. We investigated whether distractor-response binding effects also occur if the conceptual features are irrelevant to the task. To this end, we presented one stimulus at a time, requiring participants to respond to a perceptual feature (elevation), while ignoring a conceptual feature (stimulus identity). Stimuli consisted of sounds (images) of four musical instruments that varied with regard to their pitch (spatial elevation). Stimulus presentation was organized in prime-probe sequences which could be classified according to three independent experimental factors: Response relation (repeated vs. changed), distractor feature relation (repeated vs. changed), and modality relation (repeated vs. changed). The influence of these factors on distractor-based response retrieval effects are analyzed separately for reaction times and error rates.

Localization of objects across saccades based on intra-saccadic motion streaks

Richard Schweitzer[1] & Martin Rolfs[2]
[1]Bernstein Center for Computational Neuroscience Berlin; Humboldt-Universität zu Berlin, Department of Psychology; Humboldt-Universität zu Berlin, Berlin School of Mind and Brain; [2]Bernstein Center for Computational Neuroscience Berlin; Humboldt-Universität zu Berlin, Department of Psychology
richard.schweitzer@hu-berlin.de

Saccades shift objects across the retina at high velocities, yet we never perceive the blurred motion streaks they should entail. Intra-saccadic motion signals are thought to be eliminated by saccadic suppression, to preserve perceptual stability. Using a high-speed projection system, we investigated the contrary hypothesis that objects can be localized across saccades based only on the intra-saccadic motion streaks they induce. Observers made horizontal saccades towards a target stimulus (noise or Gabor patches), which moved rapidly either up or down during the saccade. Upon saccade completion, a second, identical distractor stimulus appeared at the mirror location and observers had to identify which of the two stimuli was the target. We compared performance to a replay condition, in which participants' eye movements served to simulate the retinal motion produced by saccades. Performance was significantly above chance level in saccade trials, but strongly impaired compared to replay trials, unless we blanked the target when it reached its final position to alleviate post-saccadic masking. Moreover, performance improved—even without blanking—when motion streaks were oriented parallel to their retinal motion trajectory, inducing more pronounced motion streaks. These results suggest that intra-saccadic motion smear might contribute to perceptual stability instead of hindering it.

Social Probability Discounting

Diana Schwenke & Stefan Scherbaum
Technische Universität Dresden, Department of Psychology
diana.schwenke@tu-dresden.de

The tendency to devaluate probabilistic rewards has been studied by examining the behaviour of individuals as they make their choices between certain and probabilistic options, a phenomenon that is referred to as probability discounting. In this research, we investigated whether probabilistic discounting benefits from dyadic decision making and identified which mechanism caused the expected dyadic variation. Therefore, we developed a novel task in which participants executed their choices by collecting one of two alternative coins, a certain but smaller and a probabilistic but larger one, by navigating an avatar on a virtual grassland playing field from one movement field to another one via keyboard presses. In the individual condition, participants moved their avatar alone while in the dyadic condition both co-actors had to coordinate their movements in order to finally decide on an outcome. By tracking individual keyboard presses, we were able to distinguish the individual decision in the individual condition, the initial individual pre-decision within the dyadic condition and the final dyadic consent. Pairwise comparison of these levels demonstrated a higher frequency of probabilistic but larger choices and a higher quality of decisions for the final dyadic decision compared to the individual decision and the pre-decision.

Delaying motor planning can reduce reaction times

Christian Seegelke & Tobias Heed
Bielefeld University, Department of Psychology
christian.seegelke@uni-bielefeld.de

It is commonly assumed that motor planning (i.e., the process of goal selection and specification of motor commands to achieve that goal) is completed before movement onset. Accordingly, elevated reaction time is thought to reflect increased movement complexity. However, recent research has cast doubt on the strict separation between movement planning and execution, putting into question the validity of reaction time as characterizing movement plans. Here, participants bisected lines with their dominant right hand; lines were either near or far from the hand's starting point, to the left of or above the hand, and line orientation was either vertical or horizontal. Participants adopted different movement strategies: they made direct, straight reaches when initial movement direction was perpendicular to line orientation. In contrast, they made indirect, curved reaches with a bimodal velocity profile when initial movement direction was parallel to line orientation, so that the movement was, again, perpendicular at the time of bisection. Importantly, reaction times were lower for the latter kind of reaches, despite their higher complexity. We conclude that participants postponed the incorporation of accuracy demands of the motor plan into the movement execution phase to reduce reaction times, suggesting that these processes are not organized serially.

Data Assimilation in Experimental Psychology: A Case Study from Eye Movements during Reading

Stefan Alexander Seelig
Potsdam University, Department of Psychology
sseelig@uni-potsdam.de

During fixations in sentence reading, information about the foveated word as well as adjacent parafoveal words in reading direction is acquired. Whether these words are processed serially or in parallel is subject of ongoing debate, where computational models of reading have been paramount in elaborating and testing specific processing assumptions. Since these models are becoming more and more complex, parameter inference using must be based on advanced data assimilation techniques that use the maximum likelihood approach. Previously, in a single sentence reading experiment, we used the gaze contingent boundary technique to successfully disentangle preview difficulty and preview validity effects on a post-boundary target word n+1. However, it is still unclear, whether the effect of preview difficulty, originating from the parafoveal preview during a prior fixation, is due to crosstalk from parallel processing or due to serial processing combined with forced fixations. Here we assimilate the recorded gaze data from the different experimental conditions into the SWIFT model of saccade generation during reading, to explore how different mechanisms can contribute to the observed effects.

The Binding of auditory Attention Switches and Task Switches

Julia C Seibold, Sophie Nolden, Josefa Oberem, Janina Fels & Iring Koch
RWTH Aachen University
julia.seibold@psych.rwth-aachen.de

In an auditory switching paradigm, participants heard two simultaneously presented words: a letter and a digit, which were each presented to one ear. In every trial, a cue indicated whether the target stimulus would be presented to the participant's left or right ear – indicating spatial attention switches and repetitions. When the target stimulus was a digit, participants had to do an even-odd discrimination on it, whereas on a target letter, a consonant-vowel discrimination was required. Attention (ear) switches and task (letter/digit) switches occurred independently of each other. The results revealed a reliable interaction of attention switches and task switches, indicating integrated processing (i.e., binding of attentional set and task set). This interaction of attention switches and task switches was reduced by an increased cue-stimulus interval and by using auditory exogenous cues instead of visual or auditory endogenous cues. Thus, when attention switches can be prepared for or when they are executed quasi-automatically with exogenous cues, task switches are less affected by attention switches, which means the binding of attentional set and task set is weaker. Hence, the interaction of attention switches and task switches represents an implicit measure of the binding and integration of the two switching components.

Temporal preparation reduces stimulus conflict beyond an effect on spatial attention

Verena Carola Seibold & Bettina Rolke
Eberhard Karls University Tübingen, Department of Psychology
verena.seibold@uni-tuebingen.de

Recent studies suggest that temporal preparation boosts effects of selective attention, as indexed, for instance, by smaller congruency effects in conflict tasks. Yet, it is unclear whether this beneficial effect depends on the mediating role of spatial attention or whether it occurs beyond an effect of temporal preparation on spatial attention. To investigate this question, we measured the effect of temporal preparation on congruency effects in a Stroop-like task: In a manual choice-RT task, participants responded to the color (blue or green) of a colored patch containing a color word ("BLUE" or "GREEN") that was either semantically congruent or incongruent to the color of the patch. We varied the degree of temporal preparation using blocked foreperiods of different lengths (800 and 2,400 ms). To examine the mediating role of spatial attention, we varied the spatial predictability of the colored patch: In separate blocks, the patch occurred either spatially predictable or spatially unpredictable. Replicating previous results, we observed a smaller congruency effect in case of a high degree of temporal preparation. Importantly, this beneficial effect was present in both the spatially predictable and unpredictable conditions. This result suggests that temporal preparation reduces stimulus conflict beyond an effect on spatial attention.

ERP-correlates of evaluative priming underline the importance of depth of processing and implicit affect misattribution

Laura-Effi Seib-Pfeifer & Henning Gibbons
University of Bonn, Department of Psychology
l.seib-pfeifer@uni-bonn.de

We used event-related potentials to investigate the mental processes that contribute to evaluative priming, that is, a systematic shift of evaluative judgments about neutral targets toward the valence of the primes. 64 Participants rated their liking of a-priori neutral Korean ideographs that were preceded by optimally presented emotional prime words, while 64-channel EEG was recorded. We observed a significant evaluative priming effect that was associated with a larger valence-unspecific posterior positive slow wave (PSW) in the prime ERP, suggesting deeper prime processing. Furthermore, depth of target processing as indicated by late range posterior target PSW was reduced as behavioral priming increased. Thus, the depths of prime and target processing had contrary effects on the size of the evaluative priming effect. On the other hand, smaller right-parietal target PSW for target ideographs following negative as compared to positive primes provides strong evidence for implicit affect misattribution as one major source of evaluative priming. In a linear regression analysis, the two valence-unspecific ERP indices of processing depth (prime PSW, target PSW) and the prime valence effect on target PSW were independent predictors of the size of the behavioral priming effect. Together, the three variables accounted for 40% of the variance.

Competition between reach targets within the fast visuomotor pathway

Luc Selen
Donders Institute for Brain, Cognition and Behaviour Radboud University Nijmegen
l.selen@donders.ru.nl

Within the orienting system, a fast visuomotor pathway is known to generate both express saccades and stimulus-locked responses (SLR) in neck muscles toward a novel visual stimulus. Recently, we revealed signatures of this fast visuomotor pathway also in human limb muscles prior to visually-guided reaches. The SLR on limb muscle occurs within 100 ms after the onset of the visual stimulus. However, these experiments all used a single visual stimulus to examine the SLR. Neurophysiological studies have shown that the brain reflexively generates multiple competing motor plans in parallel after onset of multiple visual stimuli, but this competition is often resolved before the reach. Here we use the SLR to as a behavioral proxy for this competition process. We explicitly asked participants to reach toward one of two possible stimuli. Behaviorally, participants showed no overt reach averaging, but we still found evidence of reflexive motor averaging in the SLR. Thus, the motor system initially generates an averaged reflexive EMG-burst in response to the onset of multiple visual stimuli, and only later cognitive processes resolve the competition to generate a goal directed voluntary movement to a single target.

Validating the Attractor Dynamics Approach to Delay Discounting

Ulrike Senftleben, Martin Schoemann & Stefan Scherbaum
Technische Universität Dresden, Department of Psychology
ulrike.senftleben@tu-dresden.de

When choosing between a small but immediate and a large but delayed reward, people discount rewards by their delay. The outcomes of such decisions are well described by discounting functions. However, in order to understand such delay discounting behavior it is necessary to look beyond decision outcomes and unfold the dynamics of the decision making process. Here, we validate our recently published attractor model that describes the within- and inter-trial process dynamics of delay discounting decision-making. In this study, we focus on inter-trial dynamics. Hence, we derive hypotheses of the inter-trial dynamics of sequences of decisions that are unique to this type of model. We test the model's predictions in three experiments based on a dynamic delay discounting computer game where we sequentially manipulate the subjective value of reward options. Our results confirm the model's predictions and thus provide support for the validity of our attractor model of delay discounting.

The true size of a familiar object influences 12-month-old infants' visual preferences

Özlem Sensoy[1], Jody C Culham[2] & Gudrun Schwarzer[1]
[1]Justus-Liebig University, Department of Developmental Psychology; [2]Western University, Brain and Mind Institute, Department of Psychology
oezlem.sensoy@gmail.com

Newborns (Slater, Mattock & Braun, 1990) and young infants (Granrud, 2006) are able to perceive objects' physical sizes across changes in distance. However, 18- to 30-month-olds still show scale errors such as trying to fit into a miniature car, even though they appear to distinguish true from unusual sizes (DeLoache, Uttal & Rosengren, 2004). We asked when infants develop a notion of the true size of an object and how this affects their visual preferences. In a preferential looking paradigm, 65 7- and 12-month-olds were presented with highly familiar objects in their true size, 50% larger than the true size (maxi size), or 50% smaller (mini size). Dependent variables were which item received the first look and the overall looking durations towards each object. Both 7- and 12-month-olds looked at the larger object first. However, only the 12-months-olds looked longer at the maxi- and mini- than true-sized objects, whereas the 7-month-olds showed no difference in looking durations. These results suggest that while even 7-month-olds can discriminate objects based on their physical size, only by 12 months have infants developed the ability to understand the true size of familiar objects.

Handwriting, emotions and grading practices

Queralt Serra
Ludwig-Maximilians-Universitaet, Psychology
queraltserra9@gmail.com

Background: Research has shown that handwriting style is a factor that influences the grading process (Markham, 1976): Namely, students whose work is presented in bad handwriting consistently receive lower grades than those with good penmanship, independent of content quality. Additionally, grader's state of mood, or teacher emotion, has been invoked as a factor influencing the writing assessment process (Caswell, 2011). The current study investigates the interplay between perceived handwriting quality, grader's mood and grading outcome. Methods and Results: N=27 School Psychology students partook in a within-subject counterbalanced design: each participant graded two different essays matched for content quality, written respectively in good and bad handwriting (a pilot study appraised handwriting quality via predetermined criteria, e.g., legibility, fluency). PANAS scores measured mood pre & post grading. Multiple regression analyses supported the predicted direction of effects: poor handwriting quality, as well as negative mood, yielded overall lower mean grading scores, however neither predictor was significant (resp. $p=0.08$ & $p=0.1$). Results are discussed in relation to contributing influences on the grading process, at the level of subjective perception and emotion.

Handlungsnotwendigkeit und spontanes Kontrastieren

Timur Sevincer[1] & Gabriele Oettingen[2]
[1]University of Hamburg; [2]University of Hamburg; New York University
timur.sevincer@uni-hamburg.de

Mentale Kontrastierung einer erwünschten Zukunft mit der gegenwärtigen Realität ist eine Selbstregulationsstrategie, die bei hohen Erfolgserwartungen hilft, zielführende Aufgaben anzugehen (z.B. für einen Test lernen) und die erwünschte Zukunft auch tatsächlich zu erreichen. Wann aber wenden Personen die mentale Kontrastierung spontan an? Wir vermuteten, dass sie dann mental kontrastieren, wenn es notwendig ist zu handeln. Handlungsnotwendigkeit haben wir operationalisiert als Dringlichkeit (Studie 1) und Zweckdienlichkeit einer Handlung (Studie 2). Studierende, die sich vorstellen mussten, ihre Bachelorarbeit in zwei Monaten anzumelden (dringliche Handlung) haben mit größerer Wahrscheinlichkeit mental kontrastiert als jene, die sich vorstellten, ihre Arbeit in zwei Jahren anzumelden (nicht dringliche Handlung; Studie 1). Ebenso haben Probanden, die einen wichtigen zwischenmenschlichen Wunsch nannten (z.B. einen Streit beilegen), mit größerer Wahrscheinlichkeit mental kontrastiert, wenn sie die Gelegenheit bekamen, zweckdienlich zu handeln (zwischenmenschliche Kompetenzen trainieren) als wenn ihnen die Gelegenheit geboten wurde, nicht-zweckdienlich zu handeln (grammatikalische Kompetenzen trainieren; Studie 2). Personen scheinen dann eher mental zu kontrastieren, wenn sie schnell und effektiv handeln müssen, um ihren Wunsch zu realisieren. Insgesamt gab es in beiden Studien nur wenige Probanden, die mental kontrastierten (jeweils 14%). Interventionen könnten den Gebrauch mentaler Kontrastierung im Alltag fördern.

Designing Touch Displays for Seniors: an Adaptive Approach

Avner Shahal[1], Carola Trahms[2] & Michael Minge[1]
[1]Technische Universität Berlin, Department of Cognitive Psychology and Cognitive Ergonomics; [2]Technische Universität Berlin, Institute of Software Engineering and Theoretical Computer Science, Quality and Usability Lab
avshahal@gmail.com

Touch has become a widely accepted input modality for Man-Machine Interfaces. Touch interaction may offer better usability and is typically related with more stimulating hedonic experiences. It would therefore be expected, that touch be the preferable interaction modality for users who experience limitations with other input devices (e.g., keyboards and mouse). Unfortunately, most touch devices do not take specific user requirements into consideration. Adaptive systems might help to overcome typical challenges. In a laboratory experiment, we investigated the benefits of different adaptive approaches in optimizing user interaction with touch displays. Forty-eight individuals participated in the study. As a between subject factor we compared 24 younger participants (18 to 30 years) with 24 seniors (older than 64 years). Participants solved a simple task with three different levels of adaptation (visible, invisible, and no adaptation). Conditions were implemented as a within subject factor in a counterbalanced presentation order. Both objective and subjective measurements were used to evaluate users' performance and preferences. Results show that both age groups benefit from touch adaptation (visible or invisible), whereas the benefit is higher for seniors than for younger adults. Visible adaptation allowed for a higher interaction speed, whereas invisible adaptation led to more accurate inputs.

Spatial contextualization of emotional and distressing scenes: Exploring predictions of the revised Dual Representation Theory

Sebastian Siehl[1], Anika Sierk[2], James Bisby[3], Frauke Nees[4], Herta Flor[4], John King[5] & Neil Burgess[3]
[1]University of Heidelberg, Central Institute of Mental Health, Department of Cognitive and Clinical Neuroscience; University College London, Institute of Cognitive Neuroscience; University of Mannheim, Graduate School of Economic and Social Sciences; [2]University College London, Institute of Cognitive Neuroscience; Charité Universitätsmedizin Berlin; [3]University College London, Institute of Cognitive Neuroscience; University College London, Institute of Neurology; [4]University of Heidelberg, Central Institute of Mental Health, Department of Cognitive and Clinical Neuroscience; [5]University College London, Institute of Cognitive Neuroscience; University College London, Clinical, Education and Health Psychology
sebastian.siehl@zi-mannheim.de

Intrusive imagery is a core symptom of Posttraumatic Stress Disorder (PTSD) and the revised Dual Representation Theory (r-DRT) proposes that intrusions arise due to the up-regulation of sensory representations and the down-regulation of contextual representations during the encoding of highly distressing events. We investigated the effect of perspective manipulation during memory encoding to enhance contextual processing of distressing scenes on the development of intrusive memories by using the newly developed Spatial Trauma Encoding Paradigm (STEP). Sixty participants were asked to watch 12 video clips containing traumatic events and to perform a topographical recognition task. Participants were randomly assigned to one of two conditions in which they had to recall one object from either the same viewpoint as presentation (egocentric) or a different viewpoint as from presentation (allocentric). Participants were required to fill in a detailed electronic diary for seven days reporting any intrusive images occurring to them. During the second session participants were assessed on a recognition-familiarity task and a spatial and temporal pattern separation task to determine differences in recall between the groups. We expect a decrease in intrusions and an increase in recognition accuracy in the allocentric compared to the egocentric group due to enhanced contextualization during memory encoding.

Attentional effects on subliminal and supraliminal face priming as a function of affective and gender congruency

Eun-Jin Sim, Marcel Harpaintner & Markus Kiefer
University of Ulm, Department of Psychiatry
eun-jin.sim@uni-ulm.de

Classical theories assume that automatic processes are autonomous and independent of higher level cognitive influence (i.e. attention). In contrast, the attentional sensitization model of unconscious cognition (Kiefer & Martens, 2010) suggests that even automatic processes require an attentional enhancement via sensitization of task-relevant pathways. We investigated attentional task set effects on face priming in a gender decision task by orthogonally varying gender congruency (prime-target: female/male face) and affective congruency (prime-target: same/different emotional facial expression) in the subliminal (masked primes) as well as the supraliminal (unmasked primes) condition. Additionally, induction tasks (affective/perceptual) served to activate corresponding task sets prior to prime presentation. While with visible primes gender congruency effects (faster reactions for gender congruent trials) were observed in all conditions, gender congruency effects with masked primes depended on affective congruency as a function of induction task. After the perceptual induction task, gender congruency effects were only obtained for affectively congruent prime-target pairings, whereas after the affective induction task gender congruency effects were observed independent of affective congruency. This shows that with subliminal primes attentional carry-over effects from the perceptual induction tasks influences unconscious processing of expressive facial features thereby constraining the gender congruency effect to affectively congruent prime-target pairings.

Competition in feature-response binding for irrelevant features

Tarini Singh & Christian Frings
University of Trier, Department of Cognitive Psychology
singh@uni-trier.de

In order to efficiently control our actions, stimuli and responses made to them are stored and integrated in Event Files (e.g., Hommel, Muesseler, Aschersleben, & Prinz, 2001). This integration is not restricted to relevant stimuli. Even irrelevant stimuli or features (i.e., distractors) that co-occur at responding can be integrated (e.g., Frings, Rothermund, & Wentura, 2007). In the presence of only one distractor, binding effects for that distractor are generally observed. In the presence of more than one distractor feature, empirical evidence is inconsistent. The present experiments tested feature-response binding effects for irrelevant features when more than one irrelevant feature was present. In two experiments feature-response binding effects for three irrelevant features (colour, shape, and location) were tested in a block-wise manner. In each block one feature was orthogonally varied to the response while the others were held constant (Experiment 1) or always changed (Experiment 2). Significant binding effects were observed for each of three features when the other two were held constant (Exp. 1). However, when the other two features were varied, significant binding effects were only observed for colour and location, but not for shape (Exp. 2).

Moral bookkeeping: A cognitive model of moral judgments

Henrik Singmann[1], Igor Douven[2], Frank Hindriks[3] & Sylvia Wenmackers[4]
[1]University of Zurich; [2]CNRS/Paris-Sorbonne University; [3]University of Groningen; [4]KU Leuven
singmann@psychologie.uzh.ch

There is widespread agreement among philosophers about the Mens Rea Asymmetry (MRA), according to which praise requires intent, whereas blame does not. However, there is evidence showing that MRA is descriptively inadequate. We hypothesize that the violations of MRA found in the experimental literature are due to what we call "moral compositionality", by which we mean that people evaluate the component parts of an action separately and then reach an overall verdict by aggregating the verdicts on the component parts. Based on this assumption we have developed a cognitive model for moral judgments, with two additive parameters—one for outcome responsibility and one for attitude responsibility. We show that this model is able to explain moral judgments for Knobe-effect type vignettes for which we manipulated the outcome (positive versus negative side effect) as well as the attitude of the actor towards the outcome. We have implemented this model in a Bayesian framework, assuming the data to follow a Beta-distribution.

Correlation between linguistic classifications and psychological clusters

Marietta Sionti[1] & Thomas Schack[2]
[1]"Neurocognition and Action - Biomechanics"- Research Group-CITEC Bielefeld University; [2]"Neurocognition and Action - Biomechanics"- Research Group-CITEC, Faculty of Psychology and Sport Sciences, Bielefeld, University Research Institute for Cognition and Robotics CorLab-Bielefeld University
marietta.sionti@uni-bielefeld.de

In the current poster, we compare existing linguistic classifications (e.g. Levin, 1993; FrameNet) of English and German motion verbs with clusters, which were based on psychological methods. More precisely, (i) we recorded motion captured data from American and German native speakers, who performed the action that corresponds to the verbs of the linguistic classifications, in order to analyse them and find the patterns that coil the actions together, (ii) we recorded event related potentials to identify the neural representation of lexical knowledge of the same verbs –as in the existing linguistic classes. Previously, Hauk, Johnsrude and Pulvermueller (2004) demonstrated that the referential meaning of action verbs is related to somatotopic activation. We evaluated the same result with our verbs and motion captured clusters. (ii) we measured the structure of mental representation (Schack, 2014) to assess the action relevant organizational structures of the same verbs and actions, since participants were asked to find the relation between words (for verbs) and avatars (for actions).

Neural Analysis of Deductive and Probabilistic Reasoning

Benjamin Sklarek, Lupita Estefania Gazzo Castaneda, Dennis Dal Mas & Markus Knauff
JLU Gießen, Allgemeine Psychologie und Kognitionswissenschaft
benjamin.sklarek@psychol.uni-giessen.de

Formal logic is characterized as monotonous and content-free with only two truth-values: true or false. Whereas, the probabilistic-approach represents a dynamic and non-monotonous logic with considering prior-knowledge. Each approach has shown great support for its claims but studies show an "instruction-answeringform-bias". Deductive studies often use dichotomous answering-forms and probabilistic studies are asking for probabilities operationalized as multilevel-scales. Therefore, the experimental design itself might trigger the kind of reasoning. We designed a conditional reasoning task in which one group of participants got deductive and the other group probabilistic instructions. Both groups were presented with conditionals of different contents (abstract vs. few disablers vs. many disablers) and in each group both a dichotomous and multilevel-scale answering-form was available. Results show that valid inferences were approved more often under deductive than under probabilistic instruction and the dichotomous answering-form was used more often under deductive than under probabilistic instruction. Another important issue raises the question which neural mechanisms underlie these behavioral results. In reasoning literature, fMRI-studies are quite rare, show diverse results and consider almost only deductive reasoning. Therefore, we have transferred the design of the behavioral study into a fMRI-study to elucidate the neural mechanisms of deductive and probabilistic reasoning (results still due).

Information search in decisions from experience

Mikhail S. Spektor & Dirk U. Wulff
University of Basel, Faculty of Psychology
michael@spektor.ch

Research on decisions under risk has recently highlighted the importance of predecisional information search. The demonstration of the so-called description-experience gap and the fact that it cannot be entirely explained by sampling error demonstrates that learning about options through experience might trigger processes that are different from those triggered in situations with explicitly stated information. However, how exactly individuals explore options prior to a decision has received little attention, and models that explicitly describe this sampling behavior are sparse. In the present study, we aimed to qualitatively evaluate the few predictions of existing cognitive models regarding sampling behavior and provide empirical means to guide future theory development. Specifically, we focused on three broader classes of questions: how do individuals allocate their samples during search? How do they decide to terminate search? And to what the degree are these differences are intra-individually stable and inter-individually different? Using the comprehensive database of Wulff, Mergenthaler Canseco, and Hertwig's (in press) meta-analysis, we show that existing models fail to predict crucial aspects of sampling behavior and present qualitative results that will serve as behavioral benchmarks for future models.

Recent response conflict reduces perceptual sensitivity at the time of distractor onset

Michael Sprengel[1], Mike Wendt[2] & Thomas Jacobsen[1]
[1]Helmut-Schmidt-University/University of the Federal Armed Forces Hamburg; [2]Medical School Hamburg
sprengem@hsu-hh.de

In order to unequivocally demonstrate that recent response conflict induces perceptual adjustments, we introduced perceptual discrimination 'probes' into a temporal flanker protocol employing coherent motion stimuli: In 11% of the trials, an only weakly coherent motion episode surprisingly occurred instead of the fully coherent distractor motion, that preceded the fully coherent target motion in the remaining 89% of the trials. We expected discrimination of the weakly coherent probes to be less accurate after incongruent trials than after congruent trials. Beyond this immediate sequence effect, we expected the penultimate trial's congurency to influence discrimination performance in the same way. While the first hypothesis could not be substantiated, discrimination performance did suffer when the penultimate trial was incongruent as opposed to congruent. Fittingly, the penultimate trial's congruency also modulated the main interference effect more strongly than the immediately preceding trial's congruency did. We speculate that this apparent retardation is due to the difficulty of influencing the perception of basic features top-down. Clearly, our findings do not warrant an explanation of direct sequential interference modulations in terms of attentional adjustments. They do, however, represent the first unequivocal case of a strictly perceptual change following so called response conict – in the expected direction.

First-language (L1) effects on second-language (L2) grammatical gender acquisition

Simone Sprenger[1] & Bergmann Christopher[2]
[1]University of Groningen, Center for Language and Cognition (Semantics and Cognition Group); [2]University of Groningen, Center for Language and Cognition
s.a.sprenger@rug.nl

The autonomy of L1 and L2 gender systems is subject of an ongoing debate. Lemhöfer and colleagues (Lemhöfer, Spalek & Schriefers, 2008; Lemhöfer, Schriefers & Hanique, 2010) have explored the possibility that cross-language gender congruency effects may be due to transfer effects during acquisition, resulting in unstable or incorrect gender representations. Here we explore effects of gender congruency in L1 speakers of Dutch on the acquisition of L2 German gender. To test how the differences between the Dutch and German gender system affect the acquisition of L2 German items, we presented 22 late Dutch learners of German with 48 pictures and collected written responses (det noun, e.g. “der Schuh”, all items were cognates) in three consecutive blocks. We observe consistent improvement across blocks for congruent and incongruent items. However, accuracy for incongruent items was significantly lower than for congruent ones. Also, accuracy for German masculine targets was consistently lower than for neuter and feminine targets. Error analyses reveal a strong bias from the L1 gender for incongruent items. We conclude that the late acquisition of German gender by native speakers of Dutch is strongly influenced by their L1 gender system.

Delayed Disengagement Effect: A comparison between a circular search and a linear search lay-out

Maximilian Stefani & Wolfgang Mack
Universität der Bundeswehr München, Institut für Psychologie
maximilian.stefani@unibw.de

Disengagement of attention is automatically delayed in a search task when a fixated start item shares search irrelevant features of the target item. This effect is typically found by applying an oculomotor search paradigm by using a circular search layout. Participants had to saccade to a peripheral circle with a particular color and to respond to the identity of the letter within it. Their fixation was held on for a short but significant moment on the irrelevant start item if the condition was congruent. Lead delayed disengagement back the irrelevant congruent color of the start item initializes probably a deeper processing which results in slower reaction times. We changed the circular search lay out into a linear search lay out which corresponds more to a real-life situation like reading from left to right direction in German. Correspondingly, all circles were arranged horizontally. 40 students processed 360 items in three blocks, counterbalanced between congruent and incongruent for color and letter, and target position. We corroborated the findings with the linear search arrangement, thus presenting further evidence for the assumption that top down processes are involved interfering with automatic driven attentional disengagement. Participants needed significantly more time for congruent color items.

Post-Error Slowing: Theoretical Mechanisms and Principal Determinants

Michael B. Steinborn & Huestegge Lynn
University of Würzburg, Department of Psychology III
michael.steinborn@uni-wuerzburg.de

Responses in speeded cognitive tasks usually slow down immediately after errors, which is traditionally explained by strategic mechanisms of evaluating and adjusting response threshold towards more conservative behavior. Although widely accepted, this traditional view has been challenged recently from two lines of research. First, one account alternatively argues that committing and error evokes an orienting response (OR), resulting in slower and less accurate performance after infrequent (but not frequent) errors (i.e., post-error RT slowing, post-error accuracy decline). Second, it has been theorized that an error-induced OR especially affects central processing mechanisms (by temporarily occupying routes supporting task-relevant memory retrieval) whereby it should by particularly increased under high (vs. low) central demand. We examined this question in the context of self-paced performance (where no intertrial separates trials from each other) with the critical variables being demand and error-event frequency. The results of a three experiments revealed a pattern that is entirely at odds with any account that is based on a strategic-evaluation mechanism. In contrast, our findings indicate that responses immediately after errors suffer from a brief interruption of task-relevant information processing triggered by search processes in memory that goes ahead with the orienting response.

Thinking about what to think – The role of meta-cognition in the adjustment of task-unrelated thoughts

Lena Steindorf & Jan Rummel
Heidelberg University, Department of Psychology
lena.steindorf@psychologie.uni-heidelberg.de

Task-unrelated thoughts (TUTs) are often associated with performance decrements in demanding tasks. During non-demanding tasks, however, people can benefit from TUTs, for example for their creative thinking or problem solving. In fact, people are able to adjust their TUT-rates to varying levels of task difficulty. In the present study we tested the idea of this adjustment being partially due to meta-cognitive beliefs about task demands. That is, in expectation of a difficult task, people should mind-wander less than in expectation of an easy task. Furthermore, less mind-wandering should result in better task performance. We tracked people's eye movements and periodically probed their thoughts during a reading task after announcing an upcoming difficult comprehension test in one and an easy test in another condition. We did not find any group differences for eye-movements, TUTs, or test performance. However, for participants anticipating a difficult test, high difficulty expectations (assed prior to the test) were associated with less TUTs during the reading task. Lacking an extrinsic motivation to focus on the text, low-difficulty-expectation participants' thoughts might have been primarily influenced by intrinsic motivational factors like topic interest. The role of meta-cognition in the adjustment of task-unrelated thought is discussed.

The influence of group membership on the processing of emotional facial actions

Miriam Steines, Tilo Kircher & Benjamin Straube
Philipps-University Marburg, Department of Psychiatry and Psychotherapy
miriam.steines@staff.uni-marburg.de

Successful social interactions are based on both partners' ability to accurately recognize and interpret each other's emotional facial actions. We hypothesize that this is achieved by a mechanism in an extended mirror neuron system and that this process is susceptible to social factors, such as group membership. To test this, we first employed a minimal group paradigm. For this experiment, 21 healthy German subjects completed a mock test to manipulate group membership. During the acquisition of functional MRI data, subjects were then presented with short videos of neutral or angry facial actions (emotion observation task) executed by members of their minimal in- or outgroup. Furthermore, actors were of either German or Turkish descent (ethnic in-/outgroup). In an emotion execution task, subjects also had to display angry or neutral expressions themselves. Results demonstrate that the processing of emotional facial actions is modulated by the identity of our interaction partner, leading to differential activations when being confronted with members of minimal and ethnic in- or outgroups. Furthermore, results indicate that social factors, such as group membership, might influence motor simulation processes in the right precentral gyrus, supporting the hypothesis that mirror neuron mechanisms are involved in empathy and social cognition.

Evaluating a Learning Model of Attentional Control on the Wisconsin Card Sorting Test

Alexander Steinke[1], Florian Lange[2], Caroline Seer[3] & Bruno Kopp[1]
[1]Hannover Medical School, Department of Neurology; [2]Hannover Medical School, Department of Neurology; KU Leuven, Behavioral Engineering Research Group; [3]Hannover Medical School, Department of Neurology; KU Leuven, Department of Movement Sciences, Movement Control & Neuroplasticity Research Group
Steinke.Alexander@mh-hannover.de

The Wisconsin Card Sorting Test (WCST) is a widely used neuropsychological test of executive functioning. Computational modeling of latent cognitive processes offers a potential route toward improved interpretability of test performance. A recent computational model of the WCST (Bishara et al., Journal of Mathematical Psychology, 54(1), 5–13, 2010) describes task performance as a function of attention shifting following reward and punishment, decision consistency, and attentional focus. In this study, we evaluated the contribution of these proposed attentional control mechanisms to performance on a computerized version of the WCST that has repeatedly been used in recent experimental and psychophysiological studies. Data from 35 healthy participants served as the empirical basis for model selection. Results indicated that performance could be modeled best when separate free parameters for attention shifting following reward and punishment as well as an additional decision consistency parameter were assumed. However, simulations revealed limitations of all considered model variants in reproducing more discrete facets of performance on the computerized WCST. We discuss the limitations of the proposed attentional control mechanisms and suggest potential model refinements.

Cognitive control in crossmodal task switching requirements: Evidence from crossmodal attention and modality compatibility in perception-action mappings

Denise N. Stephan[1], Edina Fintor[1], Magali E. Kreutzfeldt[2] & Iring Koch[1]
[1]RWTH Aachen University; [2]IfADo
stephan@psych.rwth-aachen.de

Cognitive control enables us to respond flexibly and adaptively in order to act in a goaldirected manner. In most everyday situations our behavior is multimodal within a multisensory environment. Traditionally, cognitive control has been described as central and amodal, thus free of modality-specific influences. The aim of our research was to tackle this general assumption employing the task switching paradigm. In one series of studies we revealed that switch costs can vary substantially depending on the specific modality mappings involved, and on whether these are modality compatible. To explain this influence of modality compatibility, we developed the idea of between-task crosstalk based on ideomotor backward linkages between the compatible stimulus and response modalities as part of the task sets. In another series of studies we were interested in whether modalityspecific influences are present when switching attention between stimuli presented in different sensory modalities. More specifically, the task cueing paradigm was used to demonstrate the influence of crossmodal attention switching and it was revealed that preparation, conflict adaptation and task sets themselves are modality-specific. Taken together, the empirical findings provide strong evidence against the idea of amodal cognitive control but implicate modality-specific influences on cognitive control.

From Simple Movements to Complex Skills: A Task-Dynamic Approach to Motor Control

Dagmar Sternad
Northeastern University Department of Biology, Electrical and Computer Engineering and Physics
d.sternad@northeastern.edu

How do humans learn new motor skills or re-learn basic behaviors after injury, such as reaching to drink from a glass without spilling? Much of traditional and current research on motor control has analyzed highly simplified movements in tightly controlled experiments to permit rigorous analysis. The challenge is to obtain rigorous insights without compromising the challenges of realistic task performance. We have developed a task-dynamic approach that starts with analysis of how the task constrains and enables actions and their improvement with practice. Based on mathematical analyses of the modeled task, we study how humans develop strategies that meet complex demands. Using three exemplary tasks, throwing a ball, rhythmically bouncing a ball, and transporting a "cup of coffee", we show that humans develop skill by: 1) finding error-tolerant strategies and channeling noise into task-irrelevant dimensions, 2) exploiting solutions with dynamic stability, 3) optimizing predictability of object dynamics. This approach is the basis for developing propositions about the controller: We posit that complex actions are generated with dynamic primitives, modules that overcome substantial delays and noise in the neuro-mechanical system. Using these experimental platforms we have developed interventions that assess or help restore functional behavior in patients with neurological disorders.

Mechanisms underlying trans-saccadic integration

Emma Elizabeth Marshall Stewart & Alexander C Schütz
Philipps-Universität Marburg, AG Allgemeine und Biologische Psychologie
emma.e.m.stewart@gmail.com

With each saccade to an object, the visual system must reconcile the low-resolution pre-saccadic information from peripheral vision with the high-resolution post-saccadic information from foveal vision. While humans achieve integration in a near-optimal manner, the mechanisms underlying this process are still unclear. Two potential mechanisms that might facilitate this integration are pre-saccadic attention and visual working memory. It is a well-documented phenomenon that attention pre-saccadically enhances performance at the location of an impending eye movement, and that visual working memory can retain feature information across saccades. Given the important role of attention and memory in enhancing perception and retaining information across saccades, we hypothesised that these processes would also play an important role in the integration of pre- and post-saccadic information. In a series of experiments, we investigated whether the addition of an attentional distractor around the time of a saccade, or the addition of memory load impaired the quality of integration across saccades. We found that our manipulations of both attention and memory affected participants' ability to integrate. This suggests that integration relies on both pre-saccadic attention and visual working memory to facilitate the integration process and ultimately achieve perceptual stability.

Der Kraftfahrer im Fokus: Nutzerzentrierte Entwicklung eines Konzepts für autonome Fahrfunktionen

Dominique Stimm, Julia Schäfer & Arnd Engeln
Hochschule der Medien
stimm@hdm-stuttgart.de

Monotonie durch stundenlange Kolonnenfahrten auf der Autobahn erhöht die Müdigkeit und die Gefahr von Sekundenschlaf bei Lastkraftfahrern, und stellt damit eine ernstzunehmende Ursache schwerer Verkehrsunfälle dar (e.g., National Transportation Safety Board Safety Recommendation, 1995). Das BMWI-geförderte Projekt TANGO („Technologie für automatisiertes Fahren nutzergerecht optimiert") adressiert dieses Problem in Kooperation mit Bosch, MAN, Volkswagen und der Universität Stuttgart. Zentrales Ziel des Projekts ist die Entwicklung eines Aufmerksamkeits- und Aktivitätenassistenten, der dem Kraftfahrer gezielt an seinen Fahrerzustand und das Automatisierungslevel des Fahrzeugs angepasste Nebentätigkeiten anbietet. So kann die Monotonie der Fahraufgabe durchbrochen und der Fahrer wachgehalten werden. Die Entwicklung folgt dabei den Prinzipien des nutzerzentrierten Produktentwicklungsprozesses (DIN EN ISO 9241). Zunächst wurden ethnographische Interviews und Zielgruppenbeobachtungen (Spradley, 1979) durchgeführt, indem LKW-Fahrer auf ihrer Fahrt begleitet und im Anschluss zu ihrem Erleben befragt wurden. Die Erkenntnisse dieser ersten Untersuchungen wurden in Form von Nutzersteckbriefen sowie daraus abgeleiteten Key Learnings und Handlungsräumen für die Optimierung des Nutzererlebens aufgearbeitet. Auf Basis dieser Handlungsräume wurden Ideen generiert, wie ein Aktivitäten- und Aufmerksamkeitsassistent realisiert werden könnte. Aktuell werden erste Konzepte entwickelt, die in iterativen Phasen evaluiert und überarbeitet werden.

Measuring driving behaviour – German validation of the Prosocial and Aggressive Driving Inventory (PADI)

Tanja Stoll & Martin Baumann
Ulm University, Institute of Psychology and Education, Department of Human Factors
tanja.stoll@uni-ulm.de

Within the context of cooperative driving, inventories influencing factors like the willingness to cooperate are of growing interest. Therefore, the Prosocial and Aggressive Driving Inventory (PADI) (Harris et al., 2014) was developed to focus on the behaviour that helps avoiding traffic accidents and increases cooperation between traffic participants. The self-report questionnaire measures behaviour for safe (prosocial) and unsafe (aggressive) driving behaviours. The present research investigates the validity of PADI's German translation. The questionnaire was translated using a forward-backwards method and was pilot tested for its translation clarity and applicability. A sample of N= 259 (162 females and 97 males) car drivers with an average age of 28.52 years (SD = 8.65 years) was investigated. Confirmatory factor analysis confirmed the two factor structure. Internal consistency (Cronbach a values between 0.79 and 0.84) and test-retest reliability were shown. Multiple regression analysis was also employed to investigate connections between driving behaviour and the Big Five personality traits. Aggressive driving behaviour was found to be linked to Extraversion, Agreeableness, Openness to experience and Conscientiousness while prosocial driving behaviour was found to be connected with Openness to experience and Conscientiousness.

Is control of emotional disrupt valence specific?

Elisa Straub, Andrea Kiesel & David Dignath
Universität Freiburg, Institut für Psychologie, Abteilung für Allgemeine Psychologie
elisa.straub@psychologie.uni-freiburg.de

Emotional information has privileged access to cognitive processing, which is problematic if emotions interfere with the focal task (Iordan, 2013). Therefore shielding current goals against irrelevant emotional distraction is essential for adaptive behavior. Cohen et al. (2015) observed that emotional disrupt is reduced when participants recruit cognitive control prior to the presentation of an emotional stimuli, using negative stimuli only. Following up on this research we asked whether the influence of cognitive control on emotional disrupt is valence specific or not: On each trial, participants performed an arrow version of the flanker task (Eriksen & Eriksen, 1974) followed by a color discrimination task. In between those two tasks a task-irrelevant picture was presented. Consistent with previous research, we observed that emotional in contrast to neutral pictures prolonged reaction times in the discrimination task, indicating an emotional disrupt effect. In two experiments, we systematically manipulated the valence of emotional distraction and assessed how control - as instigated by the flanker task - attenuated emotional disruption for negative (Exp.1) and positive (Exp. 2) stimuli. An additional experiment will include both, negative and positive stimuli in order to determine under which conditions control modulates emotional disrupt.

The processing of visual consequences of active vs. passive movements: A tDCS study

Benjamin Straube, Rasmus Schülke, Knut Drewing, Tilo Kircher & Bianca van Kemenade
Philipps-Universität Marburg, Klinik für Psychiatrie und Psychotherapie
straubeb@staff.uni-marburg.de

Perceiving the sensory consequences of one's own actions is essential to successfully interact with the environment. Increased temporal binding (intentional binding) as well as increased detection of delays between action and outcome have been observed for active compared to passive movements. Using transcranial direct stimulation (tDCS) it has been shown that left hemispheric anodal stimulation decreased the intentional binding effect. However, whether the left hemisphere contributes to delay detection performance between action and outcome is unknown. We investigated polarization-dependent effects of left and right frontoparietal tDCS on detecting temporal action–outcome discrepancies. After stimulation, participants were presented with visual feedback with various delays after a key press. They had to report whether they detected a delay between the key press and the feedback. In half of the trials the key press was self-initiated, in the other half it was externally generated. A main effect of electrode location indicated highest detection performance after frontal stimulation. Furthermore, we found that the advantage for active versus passive conditions was larger for left hemispheric anodal stimulation. Whereas the frontal cortex is related to delay detection performance in general, hemispheric differences seem to support the differentiation of self-initiated versus externally generated movement consequences.

Robustness of Pupil Dilation and Microsaccadic Rate in the Context of Selection-Decision

Christoph Strauch, Lukas Greiter & Anke Huckauf
Ulm University, General Psychology
christoph.strauch@uni-ulm.de

Pupil diameter has been reported to reflect binary decision processes. A recent investigation highlights the potential of pupil diameter to not only indicate the presence of binary decision processes, but to even predict their outcome. In previous work, we showed that target and distractor can be discriminated reliably in the context of letter selection. In the current two experiments, the robustness of decision related pupil dynamics is addressed. To investigate decision related effects in the presence of brightness changes, brightness changed for half of the trials from constant to dark in experiment 1 and for half of the trials from constant to bright when fixating target or distractor letters in experiment 2. A model reveals that pupil size can be employed to differentiate between target and distractor, given that the brightness is known. Moreover, predictions can be made earlier after letter onset in cases in which no changes in brightness occurred, compared to cases where brightness changed. In addition, we investigated whether microsaccadic eye-movements reflect the decision process. Implications for studies combining pupil dilation and microsaccades in the context of decision are discussed.

Multiple levels of representation for a navigable, clustered space

Marianne Strickrodt & Tobias Meilinger
Max Planck Institute for Biological Cybernetics
marianne.strickrodt@tuebingen.mpg.de

In contrast to spatial memory acquired in enclosed spaces (i.e., rooms), memory for navigable spaces (e.g., buildings) is less well understood. We had subjects learn eight target objects spread across a virtual environment, consisting of two apparent regions. Separation of regions was triggered by visual and semantic similarity (wall colour, object categories), walking distance and turning angle complexity (longest and most complex path at transition point), and spatio-temporal contingency (regions learned subsequently). A subsequent pointing task revealed increased pointing latency with increasing corridor distance to the target, and a facilitative effect of being bodily aligned with the local corridor. Moreover, pointing to targets located within one's current region was faster compared to pointing to targets in the other region, and alignment with region specific orientations enhanced pointing latency. In sum, our results indicate the formation of local and regional memory units that manifest in the form of spatial reference frames. Our local and regional effects give way to the interpretation that, when confronted with a complex navigable space, multiple levels of spatial integration are stored, potentially in a hierarchical fashion. Importantly, our results cannot be explained by concepts of exclusive local corridor units or exclusive global, all-embracing memory units

How embodied is action verb processing? Exploring the limits of effector-specific compatibility effects

Jessica Strozyk, Daniela Ahlberg, Jana Hoffstadt, Franziska Lepp & Barbara Kaup
University of Tübingen
jessica.strozyk@uni-tuebingen.de

Theories of embodied language processing have gained support from studies showing compatibility effects between underlying meaning dimensions of the language material and the task requirements. For example, it has been shown that participants respond faster to hand-related words than to foot-related words when responding with the hand, while the opposite is true for responses with the foot. In the current series of experiments, we show that this compatibility effect is restricted to certain materials and experimental settings. While we found compatibility effects for hand- and foot-related nouns in a Stroop-like task and a lexical decision task, compatibility effects for hand- and foot-related action verbs were restricted to the lexical decision task. Furthermore, compatibility effects for action verbs were reduced or even disappeared when we introduced filler items or embedded the words in a sentence context. It thus appears that effector-specific compatibility effects are not automatic for action verbs and only occur under task conditions that allow the participants to figure out the underlying meaning dimension (hand/foot) of the words. These results are not compatible with a strictly embodied view of language processing and rather support hybrid models allowing for both modal/embodied and amodal representation formats.

Querschnittliche Analyse des Jugendlichkeitsrisiko junger Verkehrsteilnehmer

Heinz Albert Stumpen[1], Benedikt Schweer[1], Guido Kattert[1], Birgitt Erdwien[2] & Christine Sutter[1]
[1]Deutsche Hochschule der Polizei, Fachgebiet II.4 Verkehrswissenschaft & Verkehrspsychologie; [2]Erdwien-Consult
benedikt.schweer@dhpol.de

Das Fahrverhalten und die Entwicklung junger Verkehrsteilnehmer nach Erwerb des Führerscheins sind bereits umfassend erforscht. Bei den bisherigen Untersuchungen fanden jedoch Anfänger- und Jugendlichkeitsrisiko keine getrennte Betrachtung. Das Anfängerrisiko, durch unsicheres Fahrverhalten gekennzeichnet, wird nur vom Jugendlichkeitsrisiko zu differenzieren sein, wenn dieses vor dem eigentlichen Fahranfang erhoben wird. Die Untersuchung hat sich zum Ziel gesetzt, anhand einer ausgewählten Stichprobe von 14- bis 16-Jährigen den Zeitpunkt der Manifestierung interner Einstellungsmuster zum verkehrsbezogenen herauszufinden. Dazu wurden in einer querschnittlichen Untersuchung (DVR-finanziertes Forschungsprojekt LAWIDA) 1.179 Jugendliche aus unterschiedlichen Agglomerationsräumen zu ihren Mobilitätsverhalten, ihren verkehrs- und fahrzeugbezogenen Einstellungen und Werten sowie zu spezifischen Risikoindikatoren mittels standardisiertem Fragebogen befragt. Hypothese dabei war, dass sich verkehrs- und fahrzeugbezogene Einstellungen bereits lange vor dem Eintritt in die Automobilität herausbilden und konsolidieren. Diese Einstellungen werden von den Heranwachsenden in den Übergang in die Automobilität mit eingebracht und schlagen sich dann u.U. als spezifisches Jugendlichkeitsrisiko in einem erhöhten Unfallrisiko bei den jungen Fahranfängern nieder. Die Ergebnisse der Querschnittsanalyse zeigen sehr deutlich, dass das chronologische Alter kaum geeignet ist, die unterschiedlichen Risikoausprägungen bei den Jugendlichen zu erklären. Bei der verkehrsbezogenen Risikoaffinität von Jugendlichen sind vielmehr andere, vor allem entwicklungsbezogene und personale Variablen geeignet, die Ausprägung potenzieller Risikobereitschaft sichtbar zu machen.

Diffusion Drift Modelling of Tactile Remapping

Kenan Suljic[1], José P. Ossandón[2] & Tobias Heed[1]
[1]University of Bielefeld, Faculty of Psychology & Sports Science; [2]University of Hamburg, Biological Psychology & Neuropsychology
tobias.heed@unni-bielefeld.de

Tactile stimuli can be represented in different spatial formats. For instance, a crossed right hand (anatomical location) lies in left space (external location). When judging which limb has been touched, humans appear to integrate these different sources of spatial information. Here, participants received, in every trial, a tactile stimulus on one foot, and reported the touched limb by a button press with the corresponding hand. Feet and hands were either uncrossed or crossed, creating spatial conflict for stimulated and/or responding limbs. Both types of conflict increased reaction times, with the strongest modulation resulting from conflict associated with the stimulated limbs. To investigate how spatial information is combined, we utilised diffusion drift models [Ratcliff, 1978]. A standard model [Ratcliff, 2008] cannot satisfactorily fit all experimental conditions. We are currently exploring extended models designed to account for modelling conflict [Ulrich, 2015] and distinct processing phases [Hübner, 2010]. Improvement of fit would provide evidence for integrative processing during tactile remapping. In sum, in the tactile domain, even a simple limb assignment involves processing that cannot be conceptualized as a simple diffusion drift decision process, reflecting a higher complexity of the interplay between the multiple influences of spatial, body-related codes in this modality.

Comparison of Object Perception in Head Mounted Display and in Desktop Monitor for Congruent and Incongruent Environments

Erinchan Telatar[1], René Reinhard[2], Shah Rukh Humayoun[3], Achim Ebert[3] & Thomas Lachmann[1]
[1]University of Kaiserslautern, Cognitive Science; [2]Fraunhofer-Institut für Techno- und Wirtschaftsmathematik; [3]University of Kaiserslautern, Computer Graphics and HCI Group
erinchantelatar@yahoo.com

Palmer (1975) and Rémy et al. (2013) demonstrated that congruency between background environment and object category impact response times in object perception tasks. Virtual Reality (VR) technologies, such as head-mounted displays (HMD), offer novel approaches to present environments and objects, which can create a strong feeling of being in the displayed environment (presence) in VR users. It is as of yet unclear how different display technologies and experienced subjective presence would affect object perception. In the current study, 21 young adults used both HMD and desktop displays to enter typical beach and home environments, while evaluating their subjective presence. In these environments, they performed object identification tasks, trying to quickly identify typical beach or home objects. In the HMD condition, participants reported significantly higher presence and showed tendentially quicker object identification independent of the object-environment congruency. However, HMD usage had no impact on effects of congruency on object identification times. The study highlights the opportunities of introducing VR technologies for psychological experiments, but also addresses potential pitfalls in its usage.

Enterprise Gamification – Investigating the Influence of Game Mechanism on Intrinsic Motivation

Markus Thiemann[1], Sandra Sülzenbrück[1] & Christine Sutter[2]
[1]FOM Hochschule für Oekonomie & Management, iwp Institut für Wirtschaftspsychologie; [2]Deutsche Hochschule der Polizei, Fachgebiet Verkehrswissenschaft & Verkehrspsychologie
241039@fom-net.de

The general focus of the study has been motivation and behaviour with regard to repetitive and monotonous tasks. The overall pursuit was to create a setting that fosters intrinsic motivation using Gamification. The Self-Determination Theory (SDT, Deci & Ryan, 1985) and the Job-Characteristic-Modell (Hackman & Oldham, 1980) served as theoretical background. According to the SDT autonomy and relatedness increase intrinsic motivation in learning situations. Our aim was to systematically alter the experimental task to increase characteristics influencing autonomy and relatedness via game mechanism. For this purpose, three groups of participants executed the same task of sorting peas from lentils in three different experimental settings. Systematically varying game mechanism, i.e. rewards, leader board, story, altered each setting. Based on the setting, the core characteristics of the task (skill variety, task identity, task significance, autonomy, feedback) were addressed differently. Using game mechanism based on competition and reward proved most useful to stimulate the intrinsic motivation in consideration of executing a repetitive and monotonous task. However, the significance of this effect could only be found for participants with a weak initial motivation (state) concerning the task.

Event-related potentials in the PRP paradigm: a comparison between young and low, intermediate, and high performing older adults

Sven Thönes, Michael Falkenstein & Patrick Darius Gajewski
Leibniz Research Centre for Working Environment and Human Factors, Ergonomics Department
thoenes@ifado.de

Elderly people show large inter-individual variability in cognitive performance but little is known about the underlying processes. In comparison to young participants (n = 36, mean age: 25 years), we analyzed the performance of a large group of healthy elderly individuals (n = 138, mean age: 70 years) in the psychological refractory period (PRP) paradigm. Based on the large variability of their performance in the dual-task situation, we clustered three groups of high, medium, and low performing elderly. The groups differed with respect to event-related EEG potentials during task preparation: CNV amplitudes prior to target presentation were significantly increased in high performing elderly relative to both other groups of elderly. Moreover, larger amplitudes of fronto-central P2 and N2 in response to the second target stimulus indicate better recall and implementation of stimulus-response mappings in high vs. medium and low performing elderly and were comparable to young adults. Peak latencies of the P2 and N2 components did not differ between performance groups, thus questioning explanations in terms of general information processing speed. Our results suggest that superior performance in dual-task situations in elderly is due to more efficient allocation of cognitive resources prior to task execution and well-preserved response-selection mechanisms.

Kognitionspsychologische Erkenntnisse zum hochautomatisierten Fahren – eine Übersicht

Manfred Thüring, Fabienne Roche & Stefan Brandenburg
Technical University Berlin, Department of Psychology and Ergonomics
manfred.thuering@tu-berlin.de

In den letzten Jahrzehnten ermöglichten neue technische Errungenschaften einen Entwicklungsschub hochautomatisierter Fahrzeuge, so dass diese in mittelbarer Zukunft zunehmend Teilnehmer im Verkehrsgeschehen werden. Die Aussicht auf die baldige Verbreitung dieser Fahrzeuge führte zu einem starken Anstieg psychologischer Forschung zum menschlichen Faktor und seinen Aktionen und Reaktionen im Mensch-Maschine-System. Der vorliegende Beitrag fasst die Forschungsergebnisse der letzten fünf Jahre zusammen, zeigt Schwerpunkte auf und leitet zukünftige Forschungsbedarfe ab. Er macht deutlich, dass wesentliche Fragen der Interaktion von Mensch und Maschine in diesem Themenfeld noch nicht bearbeitet wurden. Vor einer Episode des hochautomatisierten Fahrens ist bspw. unklar, ob Fahrer verstehen, welche Möglichkeiten und Grenzen diese Fahrfunktionen haben. Während einer hochautomatisierten Fahrt dürfen die Fahrer jederzeit in das Geschehen eingreifen. Wann sie das tun und welche Folgen das für die Fahrzeugsicherheit hat, ist ebenfalls noch nicht geklärt. Der Schwerpunkt der Forschung beschäftigte sich bisher mit der Gestaltung der Übernahmeaufforderung und ihrer Auswirkung auf das anschließende Fahrverhalten. Diese Untersuchungen legen z. B. nahe, dass auditive Aufforderungen zur Kontrollübernahme das Verhalten der Fahrer positiv beeinflussen; visuelle Aufforderungen verschlechtern es. Die mittel- und langfristigen Reaktionen von Fahrzeugführern auf die Interaktion mit hochautomatisierten Fahrzeugen sind bisher noch kein Forschungsgegenstand gewesen. Implikationen der aufgezeigten Forschungslücken werden diskutiert.

How graphical representation improves probability weighting in risky choice

Kevin Tiede[1], Felix Henninger[2] & Benjamin E. Hilbig[2]
[1]University of Konstanz, Department of Psychology; [2]University of Koblenz-Landau
kevin.tiede@uni-konstanz.de

By representing options graphically, risky choices can be improved with regard to their accordance with expected value maximization and appropriate weighting of small probabilities. Graphical formats differ from descriptive formats in various features. Therefore, we investigate which features of the representation are responsible for this improvement. In line with the sampling approach, we hypothesize that the presentation of a large and representative sample is crucial for improved probability weighting. In a between-subjects experiment, 530 participants made 60 choices between two gambles. We systematically varied the properties of the presentation formats across five conditions that cover the range from a tabular, descriptive, to a fully graphical representation. We also went beyond the original analysis by estimating CPT parameters within each condition, with a focus on the probability sensitivity parameter ?. As expected, probability weighting improves when risky choices are presented as a sample. Furthermore, graphical formats (vs. descriptive formats) reduce decision time without affecting probability weighting negatively. Our results support the sampling approach and provide insights into the effect of representation on choices.

Reorganization of Spatial Configurations During Encoding and Memorization

Johannes David Timm & Frank Papenmeier
Eberhard Karls Universität, Department of Psychology
johannes-david.timm@uni-tuebingen.de

Single objects are not represented individually in memory but the relation to other objects (configuration) has a strong impact. Former studies focused on encoding and recall only. We investigated the reorganization of spatial configurations during memorization. We presented six squares on a screen and asked the participants to memorize their locations. Afterwards the objects disappeared during the memory phase. Participants' task was the detection of a location change of a single probed object during the test phase. The side of the probed object was cued in each trial (either during encoding or memorization), thus allowing for the reorganization of spatial configurations (if possible). During test, either a complete (all objects), a congruent (cued objects), an incongruent (non-cued objects) or no (probed object only) configuration was shown. Location change detection performance did not differ between the congruent-condition and complete-condition, indicating the cue caused a complete reorganization of the spatial configuration. Participants performed worse in the no-condition and surprisingly even worse in the incongruent-condition. There was no interaction with time of cue indicating that participants could reorganize spatial configurations also during memorization. We conclude that the reorganization of spatial configurations to a subset of objects is possible during encoding and memorizing.

The cost of processing multiple feature dimensions in visual working memory

Thomas Töllner
Ludwig-Maximilians-Universität München
thomas.toellner@psy.lmu.de

Accumulating evidence suggests that perceptual coding is modulated by an attention-guiding mechanism, which allocates limited 'selection weight' to various target-defining dimensions. While these weight settings bias target processing pre-attentively, it remains unknown whether later memory-related processes are also influenced by dimensional context. In this talk, I will present three event-related-lateralization (ERL) studies designed to examine this issue. Two studies used a retro-cue task to explore working memory (WM) access as a function of dimensional context and task set. Results showed that both factors selectively influence WM access: whereas cross- relative to intra-dimensional WM targets gave rise to amplified ERLs, localization relative to identification tasks yielded speeded ERL and reaction times. The third study used an enumeration task to investigate whether multiple object individuation is dimensionally constrained. Behavioral enumeration responses were fastest for identical targets, slowest for cross-dimensional targets, and of intermediate speed for different, intra-dimensionally defined targets. EEG analyses disclosed that one source of this response slowing was feature-based, modulating attentional selection (PCN), whereas another source was dimension-based, associated with WM (P3b). As these dimension-specific findings are not reconcilable with contemporary WM accounts, I will introduce an alternative view that is based on and extends the hierarchical feature-bundle model.

Level-specific attentional adjustment to proportion congruency in the processing of hierarchical stimuli

Miriam Tomat[1], Mike Wendt[2] & Thomas Jacobsen[1]
[1]Helmut-Schmidt-University/University of the Federal Armed Forces Hamburg, Experimental Psychology Unit;
[2]Medical School Hamburg, Experimental Psychology Unit
tomatm@hsu-hh.de

Congruency effects in conflict tasks are larger when the proportion of congruent (PC) trials is increased. This PC effect (i.e., PCE) has been attributed to attentional adjustment. We investigated PC-related attentional adjustment to global and local stimulus information. Participants frequently switched between identifying the global and the local aspects of hierarchical (Navon) stimuli while PC varied between 75% and 25%. To control for stimulus-specific effects, we divided the stimulus set into one subset used to manipulate PC (i.e., induction stimuli) and another subset presented with constant frequency in both PC conditions (i.e., test stimuli). In Experiment 1, PC was manipulated in opposing ways for the two target levels (i.e., high for one and low for the other in a given block of trials). Level-specific PCEs occurred for both induction and test stimuli, suggesting that attention was shifted towards the level associated with the lower PC. In Experiment 2, PCs were matched for the two target levels. PCEs occurred for induction but very little for test stimuli. This result suggests that low PC on both levels in the same block of trials strongly reduced attentional adjustment and emphasizes the importance of control of stimulus-specific effects.

Target attractiveness affects unwanted sexual attention but not gender harassment in a computer chat

Lilian Topp & Gerd Bohner
University of Bielefeld, Department of Psychology
ligreto@gmx.de

Previous research (Siebler, Sabelus, & Bohner, 2008) has focused on gender harassment (sending sexist jokes) and found that men harassed feminist targets more than traditional targets, whereas target's attractiveness had no effect. Additional research has studied two target behaviors – gender harassment and unwanted sexual attention (sending sexualized remarks) – and found that men's hostile sexism predicted both, whereas their short-term mating orientation predicted only unwanted sexual attention (Diehl, Rees, & Bohner, 2012). In the current study, we manipulated a female target's physical attractiveness (low vs. high) and attitude (traditional vs. feminist), and studied both forms of sexual harassment. Male students (N = 161) could repeatedly send sexist jokes, sexualized remarks, or nonharassing messages to a (computer-simulated) female chat partner, whose attractiveness and attitude were manipulated through her chat profile. Independently, participant's short-term mating orientation and hostile sexism were assessed. Results showed that greater target attractiveness only led to more unwanted sexual attention. In contrast, target attitude had no effect on either gender harassment or unwanted sexual attention. Furthermore, we replicated the double dissociation of hostility and short-term mating orientation predicting different forms of sexual harassment (Diehl et al., 2012). Implications for theory and intervention will be discussed.

How to find the right app: effects of color-coded categories on visual search on smartphones

Anna Katharina Trapp[1], Niklas von Kalckreuth[2], Johanna Reibke[2] & Carolin Wienrich[3]
[1]Technische Universität Berlin, Cognitive Psychology and Cognitive Ergonomics; [2]Technische Universität Berlin; [3]Julius-Maximilians-Universität Würzburg, Arbeitsgruppe Mensch-Technik-Systeme
anna.k.trapp@tu-berlin.de

When launching an app on a smartphone, users have to complete a complex cognitive process: They have to remember and visualize visual characteristics of the target app (forms, colour, location), and perform a visual search. In this contribution, we aim to test whether the process of remembering and visualizing can be supported by a category-based colour scheme which leads to a decreased search time. In a study (N=48), we confronted participants with a visual search on a smartphone. The target-icon was not presented visually but by its name to include a visualization process. Participants interacted with an icon-set in which the icon-colour was either not related to its category (control group) or in which the icon-colour indicated the category (groups 1 and 2). Only group 2 was informed about the categorization. Group 1 was divided post-hoc into two subgroups as half of the participants noticed the colour-category relation on their own. The analysis revealed that color-coded categories helped participants to decrease their search time only if they were aware of the colour-category-relation. The results show that a category-based colour scheme can enable users to a quicker access of key-target features that help to guide attention in visual search.

We prefer what foretells over what can be foretold: On the affective value of predictive coding

Sabrina Trapp[1], Judith Goris[2], Pieter Van Dessel[3], Eliane Deschrijver[2], Roeljan Wiersema[3], Marcel Brass[2] & Senne Braem[2]
[1]Department of Cognitive Psychology, Universität Hamburg; [2]Department of Experimental Psychology, Ghent University; [3]Department of Experimental Clinical and Health Psychology, Ghent University
senne.braem@ugent.be

Many seemingly "dry" cognitive processes seem to have an affective signature. That is, recent studies started to (re)emphasize that we often evaluate our environment and our interactions with it, and seem to do so in an automatic manner. Some of these studies have suggested that we especially like information more that is linked to the process of prediction. However, these studies were unclear on whether people prefer information that can be predicted (i.e., predictable), or information that enables to predict (i.e., predictive). Across different experiments, I will demonstrate how people seem to like stimuli that were predictive, more than those that could be predicted. These studies add evidence to the idea that prediction processes are not only fundamental for cognition, but contribute to the way we evaluate our external world. Moreover, I will briefly demonstrate how some of these new measures could allow us to better understand the preference for well-structured environments or behaviors in autism spectrum disorder.

Attentional modulation of masked semantic priming by task sets: Influences from performed induction tasks and mere task cue presentation

Natalie Maria Trumpp[1], Heiko Reuss[2], Wilfried Kunde[2] & Markus Kiefer[1]
[1]Ulm University, Department of Psychiatry; [2]University of Würzburg, Department of Psychology
natalie.trumpp@uni-ulm.de

Automatic processes underlying masked semantic priming are susceptible to attentional control influences. Conversely, task sets can be triggered automatically, even by invisible cues. In three experiments, we compared attentional influences on masked semantic priming originating from previously performed induction tasks with those originating from mere presentation of task cues. In line with earlier work, masked semantic priming was consistently larger following semantic than following perceptual induction task trials. However, the priming pattern following mere presentation of perceptual and semantic task cues depended on task set dominance. When the task sets of the induction task were dominant, priming was larger following a perceptual than following a semantic cue. For weaker task sets, the priming pattern as a function of task cues was comparable to induction task trials. This reversed priming pattern in task cue-only trials most likely reflects rapid suppression of irrelevant dominant task sets. Across experiments, modulation of subliminal semantic priming by cues associated with dominant task sets did not depend on awareness or format of the task cues. This research provides insights in factors determining the dynamics of cue induced task set activation and suppression and further elucidates mechanisms underlying attentional control of unconscious semantic processing.

A simpler task for deeper insights: TOJ + TVA, and their application to animal data

Jan Tünnermann & Ingrid Scharlau
Paderborn University, Psychology
jan.tuennermann@uni-paderborn.de

The underpinnings of information processing are even less accessible with behavioral means in animals than in humans. For progress in this domain, strong and testable models are required. Bundesen's Theory of Visual Attention, TVA, goes a long way toward understanding human visual processing under the influence of attention. The theory explains many aspects of selective attention with mathematical models of the low-level interactions between sensory, task-related, and decision-level components. TVA is typically applied to data from letter report experiments. Unfortunately, letter report is not feasible with animal subjects. However, because of its mathematical nature, models for other tasks can be derived from TVA. We did this for temporal-order judgments, TOJs, which are sufficiently simple to be performed by animals. Here we report a reanalysis of TOJ data produced by mice and show that TVA's concepts can illuminate information processing in the animal mind.

Interpersonal closeness impairs the ability to recall trust decisions

Pinar Ugurlar, Michael Zürn & Ann-Christin Posten
University of Cologne, Social Cognition Center Cologne
pinar.ugurlar@uni-koeln.de

Recent research showed that interpersonal closeness may come with cognitive costs. Specifically, closeness impairs solving decision problems including information about the self and another person (Ugurlar & Posten, 2017). The current project extends these findings by testing whether the tendency to trust close others more is at least partially driven by the cognitive costs of closeness. In detail, we hypothesize that the increased cognitive costs in decisions involving close others interferes with the processing of trust-related information and also affects decision making. In two experiments, participants first played a sequence of Trust Games with either a close or a distant person. Afterwards, participants recalled the amounts they had sent before. We measured recall time and recall accuracy as proxies for cognitive costs. Consistent with our prediction, the results suggest that interpersonal closeness impairs memory associated with trust decisions. In Experiment 1, participants took more time to recall their decisions involving a close compared to a distant other. In Experiment 2, participants made more recall errors in decisions involving a close compared to a distant other. In sum, these findings suggest that interpersonal closeness may create trust by merging and subsequently confusing information about the self and close others.

The interaction between action generation and hand ownership in action-feedback monitoring

Lukas Uhlmann
Philipps-University Marburg, Department of Psychiatry and Psychotherapy
uhlmann@staff.uni-marburg.de

In order to determine whether a sensory stimulus was caused by one's own action or someone else, the brain needs to compare incoming sensory information with predictions about the sensory consequences of one's own action. In an fMRI study, we investigated whether manipulating the identity of a part of the body influences the way in which we perceive the sensory consequences of self-generated and externally generated actions. To this end, participants were asked to detect delays between simple self-generated or externally generated hand movements and the movements' visual feedback displayed on a computer screen. The visual feedback did either display the participant's own or someone else's hand. Preliminary results show that delay detection performance was worse for self-generated than for externally generated hand movements, indicating that the perception of the former was attenuated. On the neural level, an interaction between action generation and hand ownership was found in parietal and frontal areas, suggesting that self-referred processing was modulated by sensory predictions that accompany the active generation of actions. We assume that efferent signals involved in action generation processes and afferent signals relaying the identity of a part of a body interact in order to differentiate between self and other.

Task parameter influences on reach movement strategies in a go-before-you-know action selection paradigm

Philipp Ulbrich, Mareike Spengler & Alexander Gail
Deutsches Primatenzentrum GmbH, Abteilung Kognitive Neurowissenschaften - Arbeitsgruppe Sensomotorik
pulbrich@dpz.eu

Reach trajectories in go-before-you-know choice paradigms are used to infer the latency of action selection processes. Under initial target uncertainty, subjects typically perform movements that are initially aimed towards the spatial midpoint between potential targets, in accordance with neurophysiological findings of competing parallel action plans (Gallivan & Chapman, 2014). Depending on task parameters, such as the allowed movement time window, subjects either tend to show spatial averaging or immediately guess the final target (Wong & Haith, 2017). Here, we systematically vary multiple task parameters to probe under which conditions averaging or guessing occurs. Preliminary data shows that increasing reaction and movement time windows, as well as providing the opportunity to predict the requested movement onset time via an auditory countdown facilitate averaging. Increasing the duration of target uncertainty via manipulation of the SOA between go-cue and the revelation of the target with the highest payoff increases the duration of averaging, but only up to a certain time point after which subjects presumably start guessing in order to fulfill the movement time constraints. This upper temporal bound for integrating mid-flight sensory evidence supports the idea of an independent urgency signal triggering choice in case of belated evidence.

Being in a good mood makes you put more /i:/s in names, but only if you can smile

Susann Ullrich[1], Ralf Rummer[1], Christian Dobel[2] & Gerd Fabian Volk[3]
[1]Universität Erfurt, Allgemeine Psychologie und Instruktionspsychologie; [2]Universität Jena, Institut für Psychologie, Experimentelle HNO Wissenschaft; [3]Universität Jena, Universitätsklinikum Klinik für Hals-, Nasen- und Ohrenheilkunde
susann.ullrich.01@uni-erfurt.de

Using a name invention paradigm, we have shown that people preferably invent names containing the vowel /i:/ when in positive mood or for positive faces, and names with /o:/ when in negative mood or for negative faces. The Articulatory Feedback Hypothesis (Rummer et al., 2014) suggests that neural associations between muscle movements during facial emotion display and articulation are responsible for these effects. To test the implied causality, we ran the same experiments with Facialis Paresis patients. As their facial nerves are paralysed, articulatory feedback should be impaired. Compared to our studies with healthy subjects, we do not find a prevalence for /i:/ in pseudowords created during positive mood and only a tendency towards a prevalence for /o:/ during sad mood. In the face naming paradigm, however, we find that more /i:/s are used in names for positive faces compared to neutral and negative faces, whereas /o:/ is preferentially used in names for negative faces. This indicates that the link between mood and facial emotion display facilitates congruent vowel articulation, but that this connection gets impaired with a dysfunctional facial nerve. The link between positive valence of perceived faces and vowel quality, however, seems to be learned throughout life.

Task Complexity Promotes Contributions of Processing Fluency to Judgments of Learning

Monika Undorf
University of Mannheim, Department of Psychology
undorf@uni-mannheim.de

There is substantial evidence that the ease of retrieving, encoding, and perceiving materials while studying affects people's predictions of their memory performance (judgments of learning; JOLs). Several studies, however, have found that JOLs exclusively relied on people's explicit beliefs about memory. The current study therefore investigated under what conditions processing fluency affects JOLs. Specifically, four experiments tested whether difficult and complex judgment tasks promote fluency effects on JOLs. To evaluate the impact of fluency on JOLs, participants made pre-study JOLs that cannot possibly rely on fluency or immediate JOLs that can be based on either fluency or beliefs about memory. Task complexity was manipulated through increasing the number of varying cues in Experiments 1 and 2 and through increasing the number of cue levels in Experiments 3 and 4. Results revealed that differences between pre-study JOLs and immediate JOLs in calibration and resolution increased with task complexity. These findings support the idea that task complexity is a moderator for processing fluency effects on JOLs.

Monitoring in cognitive control: a distinct right-lateralized prefrontal process

Antonino Vallesi
University of Padova, Department of Neuroscience
antonino.vallesi@unipd.it

I will describe a monitoring process, which continuously checks internal and environmental contingencies in order to optimize behavior. This process, which is computationally complementary to another executive function called criterion setting, has also distinct spatio-temporal features. Anatomically, monitoring tends to be right lateralized in the prefrontal cortex above and beyond the cognitive domain or context. Temporally, it is a long-lasting, tonic process. This talk will marshal neuroimaging, electroencephalographic and neuropsychological evidence in favor of the specificity of this process in a variety of experimental paradigms. Moreover, I will also present some recent EEG data that demonstrate how inter-individual variability in the efficiency of the monitoring process can be partially predicted by frontal asymmetric biases already present at rest.

Trans-saccadic learning promotes perceptual stability

Matteo Valsecchi
Justus-Liebig-Universität Giessen, Abteilung Allgemeine Psychologie
matteo.valsecchi@psychol.uni-giessen.de

Every time we move our eyes the projections of objects on the retina and subsequently in visual cortex change position. Additionally, because of the different structure of the central and peripheral visual system, these projections are also sampled with different resolution and their geometrical properties largely change when the eyes move. One way for the visual system to deal with the discrepancy between the peripheral and central sensory input is to integrate pre- and post-saccadic object representations in a single percept across saccades. The other option is to use previous experience to establish and fine-tune a mapping mechanism that associates peripheral and central sensory input, thus reducing the perceptual prediction error that the system faces when eye movements occur. I show that if the target of a saccade is systematically increased or decreased in size during saccades, the relative appearance of size in peripheral and central vision is very quickly modulated accordingly. Despite the fact that perceptual re-calibration might emerge also when objects move on the retina due to external motion, rather than eye movements, the ubiquity of eye movements suggests that trans-saccadic learning gives a major contribution to the stability of at least one geometrical visual property, i.e. size.

Orientation priming during continuous flash suppression

Christian Valuch
University of Göttingen, Department of Experimental Psychology
christian.valuch@psych.uni-goettingen.de

Continuous flash suppression (CFS) strongly reduces awareness of visual stimuli but it is unclear to which degree fully suppressed stimuli can prime behavioral responses. We present a conservative benchmark for behavioral priming during CFS using a simple orientation discrimination task with Gabor gratings as primes and targets. In each trial, a prime was presented for 200 ms to the non-dominant eye. The prime was tilted 45 degrees to the left or to the right and rendered invisible by simultaneously flashing high-contrast luminance patterns at 10Hz to the dominant eye. The prime was immediately followed by a visible target, presented to both eyes, which was congruent or incongruent with the prime's orientation. In 768 trials participants rapidly reported the target's orientation by button presses. In another 768 trials participants tried to discriminate the prime's orientation. Despite the primes' non-discriminability, participants responded faster and made fewer errors when primes and targets had a congruent rather than an incongruent orientation. However, these priming effects were small in magnitude and only present in a subset of the participants. Using parametric stimulus manipulations, this simple priming procedure could prove useful to shed light on the boundary conditions of priming by non-discriminable stimuli during CFS.

Predicting and perceiving multisensory consequences of one's own action

Bianca van Kemenade
Philipps-University Marburg, Department of Psychiatry and Psychotherapy
kemenade@staff.uni-marburg.de

Predictive mechanisms play an important role in motor control and self-other distinction. According to the forward model theory, we generate predictions about sensory action consequences using the efference copy, which are then compared with the actual sensory feedback. Although these predictive mechanisms have been investigated extensively, most studies have focused on unimodal action feedback. However, actions usually generate multisensory consequences. In a series of behavioural and neuroimaging experiments, we investigated whether the forward model creates multisensory predictions, and aimed to unravel the underlying (neural) mechanisms. Participants performed button presses or more complex wrist movements, and received unimodal (visual/auditory) or bimodal (audio-visual) feedback of their action. This feedback was presented with a variable delay, and participants were asked whether they detected a delay between action and feedback. Furthermore, we implemented custom-made passive movement devices, with which both active and passive movements can be made, enabling us to isolate the role of the efference copy. We uncovered multisensory effects in the cerebellum, angular gyrus, and sensory cortices, and a behavioural bimodal advantage specific to active conditions. Thus, both our behavioural and our neural results point to the existence of multisensory predictive mechanisms, implemented by a supramodal representation in the brain.

The affective nature of errors and its neurochemical modulation

Henk van Steenbergen
Institute of Psychology - Leiden University Leiden Institute for Brain and Cognition (LIBC) Affect, Motivation & Action (AMA) lab
HvanSteenbergen@fsw.leidenuniv.nl

The ability to adaptively increase cognitive control in response to cognitive challenges is crucial for goal-directed behavior. Building on the idea that aversive arousal triggers adaptive increases in control, I will present recent studies on the effect of errors in a Stroop-like task on facial electromyography (fEMG) and cardiac effort. Results show that error versus correctly-performed trials tend to increase corrugator muscle activation and cardiac contractility, suggesting that errors are aversive and increase subsequent effort. I will then continue by discussing a possible neurochemical mechanism that might underlie the affective modulations of post-error adaptations. Given earlier work showing that hedonic states modulate control adaptation, we hypothesized that the mu-opioid system might modulate adaptive control modulations. This was tested in a double-blind, placebo-controlled psychopharmacological study involving a Stroop-like task. We assessed the effect of naltrexone, an opioid blocker most selective to the mu-opioid system, on post-error slowing. Consistent with our hypothesis, relative to placebo, naltrexone increased post-error slowing. Collectively, these findings support the view that errors induce aversive arousal and that this triggers adaptive effort and control. Moreover, they reveal a novel role for the opioid system in modulating such effects.

Cross-modal priming of emotion perception in children and adults

Michael Vesker[1], Daniela Bahn[2], Franziska Degé[1], Monika Tschense[2], Christina Kauschke[2] & Gudrun Schwarzer[1]
[1]Justus-Liebig-Universität Gießen, Department of Developmental Psychology; [2]Philipps-Universität Marburg, Department of German Linguistics
michael.vesker@psychol.uni-giessen.de

The multi-sensory perception of emotion is a topic of much interest. However, while the integration of information from multiple sensory modalities for the perception of emotion has been extensively studied in adults, the literature is lacking in studies which have examined the development of this capacity beyond infancy. Our study was thus aimed at exploring the nature of cross-modal interference of audible speech and facial expressions during the perception of basic emotions in older children. We tested children aged 6, 9, and 12 years, as well as adults, with a cross-modal priming task requiring participants to categorize stimuli of one modality (either words or faces) as being positive or negative as quickly as possible after priming with emotional stimuli from the other modality. We found that while face-primes had little effect on categorizing words, word-primes did show a significant effect on categorizing positive faces, increasing accuracy across all age groups in valence-congruent trials for positive faces. The 6-year-old participants also showed the quickest response-times during face-categorization when primed by positive words regardless of the target-face valence. Our results therefore demonstrate that audible emotion words have a strong influence on the perception of emotional facial expressions, particularly in younger children.

Aesthetic appreciation of cultural artifacts engages additional processes beyond a core domain-general system

Edward A Vessel[1], Ilkay Isik[1], Amy Belfi[2], Jonathan Stahl[3] & G. Gabrielle Starr[4]
[1]Max Planck Institute for Empirical Aesthetics, Department of Neuroscience; [2]New York University, Department of Psychology; [3]Ohio State University, Psychology; [4]Pomona College
ed.vessel@ae.mpg.de

Individuals can be aesthetically moved by a diverse array of visual objects (paintings, mountain vistas, etc.), and the visual features that support understanding of these objects differs by domain. Does aesthetic appreciation of different visual domains rely on the same underlying processes? Behaviorally, we find that the degree of shared versus individual aesthetic preference differs systematically across domains. Preferences for faces and landscapes contained a high proportion of shared taste, while preferences for architecture and artworks, both artifacts of human culture, reflected strong individual differences. We then measured fMRI as 16 observers made aesthetic judgments about architecture, natural landscapes or artwork. Previous work found that aesthetically moving stimuli activate portions of the default-mode network (DMN), which is typically only engaged by internally (self) directed tasks. Using multivariate pattern classification, we found that DMN activity represents aesthetic appeal in a domain-general manner. A "searchlight" analysis revealed additional prefrontal regions that only contained information about aesthetic appeal of either artwork or architecture. We conclude that visual aesthetic engagement recruits a core set of domain-general processes, but that evaluations of cultural artifacts rely more heavily on individual aesthetic sensibilities than those of landscapes, and also engage additional processes in prefrontal cortex.

Cognitive models modulate action-perception coupling in perceptual multistability

Peter Veto[1], Marvin Uhlig[1], Nikolaus F. Troje[2] & Wolfgang Einhäuser[1]
[1]Chemnitz University of Technology, Institute of Physics - Physics of Cognition Group; [2]Queen's University, Department of Psychology
wolfgang.einhaeuser-treyer@physik.tu-chemnitz.de

Theories like "common coding" suggest joint representations of action and perception, which implies a bidirectional coupling between these domains. Effects of perception on action are self-evident. Evidence for direct effects of action on perception arises from perceptual bistability: congruent movements stabilize the interpretation of an ambiguous stimulus. Can cognitive processes affect such action-to-perception transfer? Observers viewed a structure-from-motion cylinder of ambiguous motion direction. Prior to the ambiguous stimulus, we presented unambiguous versions to induce a mechanics model on how the cylinder connects to a rod; in the "belt-drive" condition the rod rotated in the same direction as the cylinder, in the "gear-drive" condition in the opposing direction. Observers rotated a manipulandum either the same way as the rod ("congruent instruction") or in the opposing way ("incongruent instruction"). In the belt-drive condition, the congruent instruction translates to congruency between perception and manual rotation. This condition replicates the congruency effect: congruent movement stabilizes the percept. In the gear-drive condition, the congruent instruction translates to *in*congruency between perception and action. Here no congruency effect in either direction is found. This suggests that perceptual and cognitive congruency effects nullify each other. Hence, the observers' internal model of a machine's operation influences action-to-perception transfer.

Dissociating Decision Strategies in Free-Choice Tasks – A Mouse Tracking Analysis

Diana Vogel[1], Stefan Scherbaum[1] & Markus Janczyk[2]
[1]Technische Universität Dresden, Department of Psychology; [2]Eberhard Karls University Tübingen, Department of Psychology
Diana.Vogel@tu-dresden.de

Everyday life offers a variety of possible actions, out of which we choose one that fits our intended goals. But how do these goals and actions work together in the mind? One way to pursue this question are free-choice tasks, in which participants freely choose a response on any given trial. However, such tasks leave participants with a substantial amount of freedom, allowing for different response strategies. To better understand participants' behavior in free-choice tasks, we used mouse tracking in an ideomotor free-choice experiment, in which participants learn the connection between an action and an effect, and subsequently have to freely choose between actions, while the effect is presented. We identified two groups that applied different decision strategies: The first group made the decision already at the beginning of the trial, irrespective of the yet to be presented stimulus, while the second group decided within the trial, being affected by the stimulus more often. This suggests that people handle free-choice tasks differently, which finds expression in a heterogeneous response behavior and an underestimation of the examined effects. Such differences potentially limit the reliability of inferences from free-choice experiments and should be considered in the interpretation of their results.

Besser abgelenkt als eingeschlafen? Übernahme der manuellen Steuerung nach hochautomatisiertem Fahren

Tobias Vogelpohl & Mark Vollrath
Technische Universität Braunschweig, Department of Engineering and Traffic Psychology
t.vogelpohl@tu-braunschweig.de

Fahrer sind generell in der Lage die manuelle Steuerung nach einer Übernahmeaufforderung in relativ kurzer Zeit zu übernehmen (M = 3 - 5 Sekunden; z.B. Gold et al., 2016). Allerdings deuten einige Erkenntnisse darauf hin, dass kurze Übernahmezeiten nicht unbedingt für die Qualität einer Übernahme sprechen (z.B. Louw et al., 2017). In zwei Fahrsimulator-Studien mit jeweils N = 60 Teilnehmern konnten wir zeigen, dass das Erlangen von Situationsbewusstsein nach einer Übernahmeaufforderung länger dauern kann als die reine Deaktivierung der Automation. Diese Effekte zeigten sich besonders deutlich bei Müdigkeit und Ablenkung der Fahrer und somit für zwei extreme Fahrerzustände. Sowohl 90% der stark abgelenkte Fahrer als auch 90% der müden Fahrer benötigten ca. 6-8 Sekunden um die Automation zu deaktivieren. Bei den Blicken auf den Seitenspiegel und den Tacho waren jedoch für beide Gruppen deutliche Verzögerungen im Vergleich zu manuellen Fahrern zu erkennen. Hierdurch war eine Absicherung der Fahrumgebung erst nach ca. 10-15 Sekunden gewährleistet. Auf Grundlage der Ergebnisse der Studien diskutieren wir den Begriff der Fahrerverfügbarkeit während automatisierter Fahrten und den Einfluss des Fahrerzustands auf die Sicherheit während einer automatisierten Fahrt. Hierauf aufbauen geben wir Hinweise für das Design von automatisiert fahrenden Fahrzeugen und definieren zukünftige Forschungsfragen.

Abgelenkte Fußgänger: eine Beobachtungsstudie

Mark Vollrath, Kilian Heuer & Anja Katharina Huemer
Technische Universität Braunschweig, Institut für Psychologie Ingenieur- und Verkehrspsychologie
a.huemer@tu-braunschweig.de

In Deutschland wird alle sechzig Minuten ein Fußgänger schwer verletz oder gar getötet, während er oder sie die Straße überquert. Ablenkung, insbesondere durch technische Geräte wie das omnipräsente Handy, wird als ein Risikofaktor vermutet, da wichtige Informationen aus der Umwelt womöglich nicht mehr wahrgenommen werden. Wie häufig Fußgänger das Handy aber tatsächlich bei der Straßenquerung nutzen, ist gerade für Deutschland bisher unklar. In Braunschweig wurden im Frühjahr N=3967 Fußgänger an drei verschiedenen Querungsfomen, nämlich an solchen mit Lichtzeichenanlage, an Fußgängerüberwegen und an besonders frequentierten „freien" Querungen beobachtet und die von ihnen ausgeführten Nebentätigkeiten erfasst. Knapp die Hälfte der beobachteten Fußgänger ging dabei während der Querung einer Nebentätigkeit nach, wobei knapp 14% aller beobachteten dabei das Handy nutzten. Eine logistische Regression zeigte, dass das Geschlecht der Fußgänger keinen Einfluss auf das Nutzungsverhalten von Handys hatte. Teenager und junge Erwachsene waren jedoch 4,6 bzw. 2,7-mal so häufig abgelenkt wie die mittlerer Altersgruppe und nutzen das Handy 4,0 bzw.2,9-mal so oft beim Überqueren der Straße.

Do older and younger adults weigh the same bases in the same manner to produce accurate metacognitive judgments?

Eftychia Volz-Sidiropoulou & Siegfried Gauggel
RWTH Aachen Medical Faculty, Institute of medical psychology
evolz-sidiropoulou@ukaachen.de

Research. The present study investigated whether reaction times (RT) are related to accuracy of delayed JOLs differently for younger and older adults. Method. Using Nelson´s PRAM type of pair associates learning task 44 younger (Mage= 24 years ± 3) and 42 older adults (Mage= 67 years ± 6) either made JOLs alone (O-JOL) or first retrieved and then made JOLs (R-JOL). RTs for making JOLs have been recorded. Results. The JOL-accuracy was significant high younger γ=.77-.78; older γ=.71-.77. In the O-JOL the regression functions relating RT to JOLs resulted in a significant linear coefficient for older ß = -11, t = -2.3,p<.05 and younger ß = -0.02, t = -2.2,p<.05 indicating that RT for making JOLs increased with decreasing JOLs. A significant amount of younger 21% and older 20% of JOL variance was explained by RT. Age differences were found in the R-JOL condition. In the younger sample neither RT nor pre-JOL retrieval predicted JOL. Though, older adults relied significantly on RT (5.3%) but mainly on pre-JOL retrieval (44%) for generating JOLs. Hierarchical regression analyses showed pre-JOL retrieval to best predict final recall by explaining uniquely 54% (older) and uniquely 82% (younger) of the variation in recall-scores.

Effects of eye height on the perception of interior space

Christoph von Castell, Heiko Hecht & Daniel Oberfeld
Johannes Gutenberg-Universität Mainz, Institute of Psychology
castell@uni-mainz.de

In virtual environments, the physical eye height (i.e., the observer's eye position relative to the ground plane) often does not correspond to the virtual eye height (i.e., the simulated eye position). From an ecological point of view, eye height is an important scaling variable. What are the consequences of dissociating proprioceptive and visual eye height information? To answer this question, we varied the observer's physical and virtual eye height (sitting vs. standing) independently of each other. We stereoscopically presented interior spaces with varying spatial layout on a head-mounted display (HTC Vive) and used head tracking such that observers could freely explore the rooms. Subjects judged the width, depth, and height of the presented interior spaces. Our results show a strong effect of virtual eye height. The subjects perceived all spatial dimensions as being larger when the simulation corresponded to a sitting as compared to a standing viewing position. In contrast, the variation of physical eye height did not have a substantial effect. In sum, our results indicate that observers mainly rely on visual information and do not consider proprioceptive information when it comes to judgments of the spatial layout of virtual environments.

Partial tritone substitution: More consonance by stream segregation?

Lutz von der Burchard & Christian Kaernbach
Christian-Albrechts-Universität zu Kiel, Institut für Psychologie
lvdb@gmx.net

Tritone substitution is a chord substitution prevalent in jazz. In a ii/II-V-I progression, the dominant chord (V or V^7) may be replaced by its tritone substitute (♭II/♭II^7). In case of a partial substitution, the dominant chord is kept in some parts of the score, while it is substituted elsewhere, typically the root notes in the bass line. In such a sequence, the middle chord contains a bass note (♭II) that is in strong harmonic conflict with the rest of the chord (V^7). We hypothesized that this dissonance might get resolved by auditory stream segregation, with plausible progressions occurring in each stream (discant: descending fifth, II-V-I, bass: chromatic line II-♭II-I). To test this hypothesis, we presented II-V^7-I sequences where the dominant root note was either replaced by a tritone or a minor second. We compared two experimental conditions supporting one-stream or two-stream interpretation. Forty-two listeners rated sequences and individual chords for valence and correctness. We found clear-cut effects of stream-segregation on valence and correctness ratings. For sequence ratings, we did not find significant interaction that would support dissonance masking by stream segregation. When comparing sequences with isolated chords, we found a significant embedding advantage concerning correctness ratings of two-stream tritone-substitution sequences.

Smoothies – Consumer and Preference

Milena von Heydebreck & Florian Röser
University of Applied Sciences Darmstadt, Economic Psychology
florian.roeser@h-da.de

Due to the increasing mobility and flexibility in society, the out-of-house market for food and drinks increases. Beside the typical fast-food products, people consume smoothies on their way as well. A questionnaire was developed to find out the requirements of German smoothie consumers for the out-of-house market: their taste preferences and the socio-demographic distribution. Additionally, the willingness to pay a certain price was queried. 271 persons (from the Döhler GmbH volunteer's pool) started the online-questionnaire (N=233) among those were 181 Smoothie consumers – which drink and buy Smoothies. In general, 76% stated, that they use a Smoothie as a snack for in-between meals and woman rate Smoothies in general better than men. People between 31 and 50 years (45%) are the most frequent consumer, however, no relation could be found between (the frequency of) commuting to work and buying smoothies. The results showed that 63% of the (asked) people associated smoothie and healthiness. Additionally, the more often people consume smoothies, the more often they indicate that the smoothie should replace up to two of the recommended five portion of fruits (5 A Day). These findings will be discussed based on the actual literature.

The diffusion model can be used to analyse slow response time tasks

Mischa von Krause, Veronika Lerche, Gidon Frischkorn, Anna-Lena Schubert & Andreas Voss
University of Heidelberg, Psychologisches Institut
mischa.vonkrause@psychologie.uni-heidelberg.de

The diffusion model (Ratcliff, 1978) has so far mostly been used to study the cognitive processes involved in binary decision tasks with fast reaction times (<1.5 seconds). It remains an open question whether the model can also be applied to tasks resulting in distributions of slower reaction times. While the diffusion model could successfully be fitted to the data from a slow figural decision task paradigm (Lerche & Voss, in press), the generalizability of this finding is unclear. We tested a large sample (n>100) using 18 different decision tasks. Experimentally, we manipulated task domain (figural, numerical, and verbal) and decision speed (fast vs. slow). Analyses of model fit revealed that the diffusion model could be fitted equally well to fast and slow decision tasks. Our results speak in favor of an application of the diffusion model to different types of slower response time tasks.

Thinking Locally or Globally? – Trying to Overcome the Tragedy of Personnel Evaluation

Momme von Sydow[1], Niels Braus[2] & Ulrike Hahn[3]
[1]Ludwig-Maximilians-Universität München, MCMP; [2]Ruprecht-Karls-Universität Heidelberg, Institut für Psychologie, Sozialpsychologie; [3]Birkbeck College University of London, Department of Psychology
Momme.von-Sydow@lrz.uni-muenchen.de

If members of a group interact positively or negatively with other members of the group, their individual performance may be dissociated from overall effects of their membership. Human resource management should be aware of such dissociations, based for instance on altruistic or egoistic behavior, or more generally on any behavior helping or harming the group. Correspondingly, von Sydow & Braus (2016, 2017) and von Sydow, Braus & Hahn (2017) have investigated Two-level Personnel-Evaluation Tasks (T-PETs), where the best overall team was not necessarily composed of the individually best employees. Participants in the role of personnel managers in sequential learning task learned about individual and group earnings and were assigned to repeated personnel evaluation tasks and selection tasks. We have found that people tend to neglect group-level effects. In Experiments 1 we here used various cover stories with local or global emphasis (emphasis on the individual, the group or both). In Experiment 2 we focused participants on the individual level, the group level, or on both by rating individual performance, group performance or both. These strong manipulations yielded some improvement, but overall the results were mixed. We briefly discuss the practical and theoretical implications of our findings.

Examining the mechanisms underlying the item-specific proportion congruent effect using the process dissociation procedure

Anne Voormann, Kerstin Dittrich, Nadine Schimpf & Karl Christoph Klauer
Albert-Ludwigs-Universität Freiburg, Sozialpsychologie und Methodenlehre
anne.voormann@psychologie.uni-freiburg.de

The item-specific proportion congruence effect (ISPC-effect) describes the variability of the size of the Stroop effect relative to the proportion of congruent trials within a color word. Two well-known theories provide an explanation for this effect: the theory of contingency learning (cf. Schmidt, de Houwer, & Rothermund, 2016) and the theory of cognitive control (cf. Blais, Robidoux, Risko, & Besner, 2007). We aimed to discriminate these theories using two experimental conditions with ISPC-manipulation, one condition with biased contingencies, where items appeared with simply one color word combination (e.g. the word RED always in blue), and one condition without biased contingencies, where items appeared in several combinations. Only in the condition with biased contingencies, contingency learning was possible. Additionally, we implemented a control condition without ISPC-manipulation. Two studies were conducted that used different sets of neutral items. The two theories expect different results regarding the size of the Stroop effect and the influence of the process "word reading" in the mostly incongruent trials. To examine the influence of "word reading", we apply the process dissociation procedure provided by Lindsay and Jacoby (1994). Results of two studies are discussed to conclude whether contingency learning or cognitive control primarily affects the ISCP-effect.

Sequential Sampling Models with Variable Boundaries and Non-Normal Noise: A Comparison of Six Models

Andreas Voss
Heidelberg University
andreas.voss@psychologie.uni-heidelberg.de

One of the most prominent response time models in cognitive psychology is the diffusion model: While diffusion models have been tested exhaustively for fast perceptual tasks, it is unclear whether the model is still valid when tasks are more difficult and thus require a longer phase of information accumulation. For example, a collapsing of decision bounds may commence when the correct response is not immediately obvious. Another possible modification of the diffusion model regards "jumping to conclusion", which cannot be modeled adequately when a constant drift and normal noise is assumed. In this talk, I compare the fit of six different versions of diffusion models to data from speed and accuracy conditions of simple vs. and more complex classification tasks. Specifically, performance of a standard diffusion model was compared with three different collapsing boundary models and two models with heavy tailed noise distributions that allow for jumps in the decision accumulation. Across the four experimental conditions, a model with constant thresholds but heavy tailed noise distributions (i.e. jumps in decision accumulation) fitted data best.

Time course of tactile modulation in reaching

Dimitris Voudouris & Katja Fiehler
Experimental Psychology, Giessen University
dimitris.voudouris@psychol.uni-giessen.de

Tactile sensitivity on a moving limb is decreased, likely because of efference copy mechanisms that predict and, as a result, attenuate the afferences of one's own movement. Yet, tactile sensitivity is particularly important when acting in a complex environment because it can provide critical signals related to the performed action. Here, we examined how tactile sensitivity is modulated during the course of a reaching movement. Brief vibrotactile stimuli of variable intensities that had to be detected were presented on the participants' right index finger shortly before or at multiple time points during reaching to the static unseen left hand. As expected, tactile detection thresholds were increased shortly before and during reaching compared to rest. Importantly, detection thresholds were more strongly increased shortly before movement onset and during the latest phases of reaching. This suggests that tactile sensitivity is flexibly modulated during the course of reaching showing stronger suppression on the moving limb when somatosensory signals from the static, target hand need to be preferentially processed, for instance, to plan the reaching movement or to evaluate its outcome.

Towards an emotion-sensitive brain-computer interface for neuroadaptive assistive technology

Mathias Vukelic
Fraunhofer-Institute for Industrial Engineering IAO
mathias.vukelic@iao.fraunhofer.de

Technology is increasingly sensitive to context, personal needs and preferences. I envision developing adaptive human-machine interfaces to support people during their daily life. A special focus is at identifying emotional user reactions based on brain signals during human-technology interaction (HTI) and make them available to interactive systems. Current experimental paradigms use established stimulus material (e.g. pictures) to induce affect and make them measurable. These paradigms are not well-suited to study brain responses in real-world applications, e.g. during the interaction with adaptive technologies. Thus, there is a significant lack of basic knowledge about the underlying neurocognitive processes of affect HTI. I will present an experimental paradigm, called AFFINDU (Adaptive System Behaviour for Affect Induction), resembling a plausible scenario of use during HTI. This paradigm was used to study the underlying neuronal signatures of affective user reactions towards self-initiated assistive system behaviour. I will show neuronal signatures of affect in the time- and spectral domain from acquired electroencephalographic signals, and haemodynamic signatures, such as measured via functional near-infrared spectroscopy. Age-related differences in these underlying neuronal signatures will also be presented. This knowledge will help to design powerful tools for individualized adaptive systems for future applications.

Timescales of different types of saccadic adaptation

Ilja Wagner & Alexander C. Schütz
Philipps-Universität Marburg, AG Allgemeine und Biologische Psychologie (AE Sensomotorisches Lernen)
Wagneri@students.uni-marburg.de

The oculomotor system is not only capable of executing saccadic eye movements with exceeding accuracy, but also maintains this high accuracy across the human lifespan. For this purpose, an adaptive learning mechanism (saccadic adaptation) monitors every executed saccade and evaluates its accuracy. If it detects movement errors, the learning mechanism uses bottom-up and top-down signals to reestablish the accuracy of the corresponding saccade. Previous studies showed that saccadic adaptation corrects short-term-errors, resulting from bottom-up signals, on two timescales of learning and forgetting (Ethier, Zee, & Shadmehr, 2008). The current study asks if it corrects top-down errors (Schütz, Kerzel, & Souto, 2014) on the same timescales. In two experiments, participants had to perform saccades to a stimulus-compound and to discriminate an element within it. Saccadic adaptation was induced via either a bottom-up error (the whole compound moved during the saccade) or a top-down error (the task-relevant element changed its position in the compound between experimental phases). The results showed similarities as well as differences between the error types. Both error-types were corrected through an initial fast and a subsequent slower adaptation, but the initial correction had a greater magnitude for top-down errors. Forgetting only occurred in context of top-down errors.

Limits of value-based attentional priority

Annabelle Walle, Michel D Druey & Ronald Hübner
University of Konstanz, Cognitive Psychology
annabelle.walle@uni-konstanz.de

Previous evidence suggests that value-associated stimuli attract attention even if they are task-irrelevant and cause interference. Often, learning paradigms are used in such studies to first associate previously neutral stimuli with value. In a second phase, these stimuli then serve to assess the effects of learned value on attention in a test task. In the present study, we examined to what extent the learned value associations from a visual search task result in interference in a subsequent flanker task, if the value-based, task-irrelevant features are presented spatially separated from the flanker stimuli. Specifically, in the search task, certain colors were initially associated with high or low monetary value. In the flanker task, the task-irrelevant flanker stimuli were then presented within accordingly colored frames. Moreover, the flanker stimuli were either congruent, incongruent, neutral or absent. However, we could not find any effect of value in the flanker task for any flanker type. Our results thus suggest that the effects reported in previous studies emerge only, if the learned value is directly bound to the distractor stimuli, but not if they are spatially separated. Possible reasons for this discrepancy will be discussed.

Aesthetic experience during reading of poetry leads to increased local processing difficulty, but also increased global ease-of-processing

Sebastian Wallot & Winfried Menninghaus
Max Planck Institute for Empirical Aesthetics
sebastian.wallot@aesthetics.mpg.de

In the present study, two seemingly competing hypotheses about cognitive processing of poetic language and its implications for subjective aesthetic experience were tested: While the cognitive handicap hypothesis states that poetic language is inherently more ambiguous, and hence more difficult to process, the cognitive fluency hypothesis suggests that cognitive ease-of-processing is positively correlated with the emergence of aesthetic experience. To test these hypotheses, a set of original poems that featured two of the most prominent poetic language features, rhyme and meter, were re-written so that their manipulated versions featured only rhyme, only meter or neither of the two. Participants read the different poem versions while their eye movements were recorded. Additionally, participants provided subjective ratings on their aesthetic experience for each poem. Surprisingly, the results showed evidence for both hypotheses: Poems that were rated to strongly invoke aesthetic experiences showed higher local processing difficulty (i.e., higher total gaze durations), but at the same time also higher global ease-of-processing (i.e., lower total reading times). Moreover, path analysis of the subjective and objective measures suggests that the objective text features impact subjective aesthetic experience, which in turn leads to changes of eye movements during reading.

Warum passieren Unfälle mit ungeschützten Verkehrsteilnehmern?

Stefanie Weber[1], Karen Tschech[1] & Kristin Blum[2]
[1]Universitätsklinikum Regensburg, AARU Verkehrsunfallforschung; [2]AUDI AG, AARU Verkehrsunfallforschung
stefanie.weber@aaru.de

2016 hatten mit 64,0 % PKW-Nutzer den höchsten Anteil an Unfällen mit Personenschäden. 27,8 % der Beteiligten waren ungeschützte Verkehrsteilnehmer, wobei es sich bei 14,8 % um Fahrradfahrer, bei 7,3 % um Krafträder und bei 5,7 % um Fußgänger handelte (Statistisches Bundesamt, 2017). Der Großteil der Unfälle wurde durch menschliches Fehlverhalten verursacht. Während die amtlichen Unfallursachen nur eine allgemeine Einschätzung ermöglichen, erlaubt die Arbeit der Unfallforschung eine detailliertere Betrachtung. Ein Beispiel hierfür ist die Arbeit der Audi Accident Research Unit (AARU), einem interdisziplinärem Forschungsprojekt des Universitätsklinikums Regensburg in Zusammenarbeit mit der AUDI AG. Anhand der 5-Step-Methode werden die von der AARU analysierten Unfälle psychologisch bewertet. Mittlerweile wurden von der AARU über 1.200 Unfälle detailliert analysiert. Unterscheidet man dabei nicht nach der Art der Verkehrsbeteiligung, zeigt sich, dass die Unfallursachen in mehr als der Hälfte der Unfälle in der Informationsaufnahme liegt. Betrachtet man jedoch nur Unfälle mit ungeschützten Verkehrsteilnehmern, die in den Daten der AARU 10% ausmachen, so verschiebt sich die Verteilung der Unfallursachen: Obwohl die häufigste Kategorie weiterhin die Informationsaufnahme bleibt, gewinnen in diesen Unfällen die Bereiche Informationszugang und Zielsetzung an Bedeutung. Es werden die Unfallursachenverteilungen der analysierten AARU Unfälle in Abhängigkeit der Zusammensetzung der Unfallbeteiligten dargestellt und miteinander verglichen.

Egocentric and allocentric Simon effects in task sharing

Tom Weber, Christina Bermeitinger & Pamela Baess
University of Hildesheim, Institute for Psychology
tomweber90@googlemail.com

When dividing a simple reaction time task such as the Simon task between two participants, it has previously been suggested that Simon effects occurred when working alongside with a co-actor in a Go/NoGo version of the Simon paradigm, but not when no co-actor was involved. This was taken as evidence for the so-called co-representation of the partner's actions. However, recent studies questioned the social nature of this co-representation account by providing evidence for Simon Effects in a single Go/NoGo Simon task with external reference objects. In a new variant of the Simon paradigm using stick-figure manikins, two different types of Simon effects could be differentiated, i.e., an egocentric (based on the body-midline) and an allocentric (based on the background object) Simon effect. In the present study, we run this variant of the Simon paradigm as a Go/NoGo version either involving a co-actor or not. We observed an egocentric Simon effect in the joint Go/NoGo condition, but, in contrast to previous studies, an allocentric Simon effect in the single Go/NoGo condition. Our results offer further support for the idea that external objects (not necessarily co-actors) foster the formation of spatial codes.

Multiasking of Young and Older Adults in Ecologically Valid Scenarios – Virtual Car Driving

Konstantin Wechsler[1], Christin Janouch[2], Uwe Drescher[1], Mathias Haeger[1], Otmar Bock[1] & Claudia Voelcker-Rehage[2]
[1]German Sport University Cologne, Physiology and Anatomy; [2]Chemnitz University of Technology, Institute of Human Movement Science and Health
k.wechsler@dshs-koeln.de

The ability to perform multiple tasks concurrently is omnipresent in modern society. Working performance, leisure time, social interaction as well as everyday-activities such as car driving challenge young and older society members equally. An immersive driving simulator was used to compare the driving- and loading task performance of 124 (63 young (20-30y) and 61 older (65-75y)) participants. We used multiple loading tasks (typing, memory, reasoning) modelled after real-life activities and embedded them into a car-following paradigm. Reaction time and correctness (loading tasks) and velocity, lane position and collisions (driving task) were used to evaluate single- and multitasking performance. We found that compared to single-task driving, participants in the multitask-condition drove at a lower speed, with a higher speed variability and at a more lateral lane position. We further found that compared to young participants, older ones drove at a lower speed, with a higher speed variability and at a more lateral lane position. In other words, old age and multitasking had similar effects on driving, and possibly so for similar reasons, namely, a higher cognitive demand of driving. Accordingly, only older participants increased their reaction time and reduced their correctness when typing under multitask compared to single-task conditions.

Optimizing across task congruency by stimulus selection – unless there is a routine sequence

Christina Weckwerth[1], Robert Gaschler[1], Fang Zhao[1], Eva Röttger[2] & Hilde Haider[2]
[1]Fernuniversität Hagen, Allg. Psychologie LME; [2]Universität zu Köln
christina.weckwerth@fernuni-hagen.de

While many multitasking studies have documented costs in RT when features of the tasks mismatch (i.e., a left stimulus or reaction in one and a right stimulus or reaction in the other task), little is known about circumstances under which participants optimize across task congruency when they are partially free to select (in)congruent stimuli. Participants pressed a left vs. right key to a centrally presented "1" or "2" with their left hand. With their right hand they were to pick either the letter presented in the left, right, upper, or lower position. Left and right position led to (in)congruency with the other task. In the first trial of each package of four, letters at all positions were available. Options were shrinking until new letters were presented after four trials. In Experiment 1 (N=20) participants optimized across task congruency by selecting the letter position congruent with the response in the two-choice task. In Experiment 2 (N=32) this was no longer the case, as single task blocks preceding the multitasking blocks apparently established routine sequences of stimulus selection which were not altered to optimize across task congruency.

Decision support as a possibility to improve decision-making performance in patients with mild Alzheimer's disease

Elisa Wegmann[1], María García Arías[2], Silke M. Müller[1] & Matthias Brand[3]
[1]University of Duisburg-Essen, General Psychology: Cognition and Center for Behavioral Addiction Research (CeBAR); [2]Universidad Francisco de Vitoria Gabinete de Orientación Educativa; [3]University of Duisburg-Essen, General Psychology: Cognition and Center for Behavioral Addiction Research (CeBAR); Erwin L. Hahn Institute for Magnetic Resonance Imaging
elisa.wegmann@uni-due.de

Background and aims: Patients with mild Alzheimer's disease (mAD) have difficulties in learning, memory, and executive functions. These abilities are important mechanisms in decision making under risk, which is also impaired in patients with mAD (Delazer et al., 2007). The current study addresses the research question if decision support can compensate for mAD patients' impairments in working memory and executive functions when making decisions under objective risk. Methods: Fourteen patients diagnosed with mAD but no other neuropsychological disease and 14 age-matched control subjects performed the Game of Dice Task (GDT) measuring risky decision making three times at intervals of 2-3 weeks. In the second investigation, participants received decision support. At the first and third session, the original GDT was performed. Working memory and executive functions were also assessed. Results: Patients with mAD showed impairments in executive functions and decision-making performance compared to controls. However, mAD-patients could improve GDT performance with decision support and this improvement maintained in the third investigation without decision support. Conclusions: mAD-patients were able to improve and sustain their decision-making performance after having received decision support. It is discussed whether the integration of supportive information in everyday decision-making situations may facilitate daily life management of mAD patients.

Mental rotation skills of expert basketball players: Identifying on-court playing patterns

Matthias Weigelt, Karsten Schul & Daniel Memmert
University of Paderborn, Psychology and Movement Science
matthias.weigelt@uni-paderborn.de

Basketball coaches use tactic boards to instruct players on the upcoming playing pattern. This often requires to perform mental transformations of the stimulus material. Forty-six male basketball experts and 123 novices (59 males) were tested in the mental rotation task – basketball (MRT-B), which was a paper-and-pencil test version similar to the original MRT by Vandenberg and Kuse (1979). Instead of three-dimensional cubes, six different basketball playing patterns were used as stimuli. The criterion stimulus of the 24 items was always displayed in upright orientation (i.e. basket on the top) on the left side. In the same line, two "correct" alternatives (one stimulus rotated by 90° to the left or right and one by 180°) and two "incorrect" alternatives (either rotated mirror-images of the criterion stimulus or rotated images of a different playing pattern out of the set) were displayed in different positions. The task was to identify the "correct" alternatives. Results demonstrated (1) an effect of gender, with more items solved for male novices as compared to female novices, and (2) an effect of expertise, with better performance for expert players than for male novices. Accordingly, basketball experts show better mental rotation skills for sport-specific stimulus material.

Do we choose what we remember because we pay more attention to it?

Regina Agnes Weilbächer[1], Jörg Rieskamp[1], Ian Krajbich[2] & Sebastian Gluth[1]
[1]University of Basel, Faculty of Psychology; [2]Ohio State University, Department of Psychology
regina.weilbaecher@unibas.ch

The impact of memory processes on decision making receives growing interest. Recent research demonstrated a bias in preferential choice: people tend to prefer remembered over forgotten options (Gluth et al., 2015). The aim of the present study was to replicate this memory bias and to investigate the role of attention as a potential underlying mechanism of this bias. Attention is known to bias decisions, as people tend to prefer options that they have looked at longer (Krajbich et al., 2010). Therefore, we predicted that attention is mediating the memory bias because people fixate more on remembered options, and options that are fixated more are more likely to be chosen. To test this hypothesis, we conducted a within-subject eye-tracking experiment. 40 participants learned associations between screen locations and snacks and later decided between two options with and without having to retrieve them from memory. We replicated the memory bias in preferential choice. However, we did not find evidence for a mediating effect of attention on this memory bias. Interestingly, we found that the tendency to fixate the chosen option more than the unchosen option was amplified in decisions from memory. Our study elucidates the interplay of memory, attention, and choice.

Unconscious processing of emotions alters the "feeling" of neutral objects: evidence from 3-4- month-old infants

Lior Weinreich[1], Chiara Turati[2], Chiara Filipponi[2], Susanna Frigerio[2] & Elena Nava[2]
[1]Ludwig Maximilian University of Munich, Faculty of Psychology and Educational Sciences; [2]University of Milano-Bicocca, Department of Psychology
l.weinreich@campus.lmu.de

Infants are able to unconsciously process emotions very early in life, as documented by recent studies (e.g., Jessen & Grossmann, 2015; Nava et al., 2016), and appear to be more sensitive to negative than positive emotions. In this study, we investigated whether infants as young as 3 months of age associate a subliminally presented negative emotion to a neutral object and modulate its perception, as assessed through changes in skin conductance response. Methods: N = 10 infants participated in the study. Using a simplified version of the affective priming paradigm, infants were presented with two neutral objects that were primed with subliminally presented emotional faces (happy and angry). We hypothesized that if infants unconsciously associated particularly the negative emotion with the neutral object, the presentation of the object alone would elicit higher responses, as assessed with looking times and skin conductance responses. Results: Preliminary results show that, while SCRs did not differ between objects primed with either a happy or angry face, infants looked less to the object primed with an angry face. This avoiding behavior suggests that infants perceived the object primed with the angry face as less attractive than the object primed with the happy face.

An adjusted PSI-method for the stop-signal task

Lorenz Weise
RWTH Aachen, Institute für Medizinische Psychologie und Medizinische Soziologie
lweise@ukaachen.de

The stop-signal task (SST) is used in countless studies measuring response-inhibition and allows computation of the stop-signal reaction time (SSRT), the time needed to stop a response, by varying the delay between the go- and stop-signal (stop-signal delay, SSD). However, because of the nature of the task, the SST can become very long, especially when including multiple conditions. To reduce the number of trials needed for computing the SSRT, Livesey and Livesey (2017) proposed adopting an adaptive Bayesian sampling method (PSI method; Kontsevich & Tyler, 1999) for choosing the optimal SSD per stop-trial. Here, I use behavioral findings and SST simulation results to show that the standard PSI method runs into trouble when subjects slow their go-responses, a common finding in SSTs. I propose an adjusted PSI method, which continuously predicts subjects' upcoming go-response times in order to adapt to changing go-response speeds and still allow optimal choice of SSDs. Simulation as well as behavioral results demonstrate the adjusted PSI method's properties compared to the standard PSI method and traditional methods, such as the staircase.

My mistake? Enhanced error processing for commanded compared to passively observed actions

Lisa Weller, Katharina A. Schwarz, Wilfried Kunde & Roland Pfister
University of Wuerzburg, Department of Psychology III
lisa.weller@uni-wuerzburg.de

We often ask other people to carry out specific actions for us in order to reach our goals. However, these commanded actions sometimes go awry and goal attainment is hindered by errors of the acting person. Here we investigated how the commanding person processes these errors of another person. Because of the personal involvement in commanded actions, error processing during these actions should be enhanced compared to passively observing another person's actions. In our study, participants either commanded another agent to perform one of four keypress responses or they passively observed the agent responding. The agent could respond correctly or commit an error in either case. We compared error processing of commanded and passively observed actions using observation-related post-error slowing (oPES) as a behavioral marker and observed-error-related negativity (oNE/oERN) and observed-error positivity (oPE) as electrophysiological markers. Whereas error processing, as measured via the oERN, was similarly pronounced for commanded and observed actions, commanded actions gave rise to stronger oPES and a stronger oPE. These results suggest that enhanced monitoring is an automatic by-product of commanding another person's actions.

Should interpersonal distance be thought of in field-theoretical terms?

Robin Welsch, Christoph von Castell & Heiko Hecht
Johannes Gutenberg-Universität Mainz, Psychologisches Institut
welsch@uni-mainz.de

Previous studies have found violations of preferred interpersonal distance to be associated with discomfort when personal space is entered. However, the exact function of discomfort and interpersonal distance is not yet specified. In this study, we explore the relation of interpersonal distance with discomfort and extend previous findings concerning intrusion of personal space and discomfort towards distances outside of personal space. For this we presented subjects with 15 interpersonal distances ranging from 40 to 250 cm and obtained verbal and manual ratings of discomfort. Compensatory behaviors such as gaze aversion or shift in distance were controlled for. We found discomfort and interpersonal distance to strongly depend on the size of personal space. While discomfort rose rapidly when personal space was entered, the gradient was less steep for distances exceeding the limits of personal space.

Testing boosts grammar acquisition: Insights from the learning of Latin morphosyntax

Katharina Wendebourg[1], Birgit Ötttl[2], Eduard Berndt[1] & Barbara Kaup[1]
[1]Tübingen University; [2]HU Berlin
katharina.wendebourg@uni-tuebingen.de

According to research on the testing effect, testing can not only be used to measure learning performance, but also to foster learning itself. A beneficial effect of testing has been shown for various domains, such as vocabulary learning or learning from text. In the present study, we investigated whether testing is also beneficial for grammar acquisition. We presented adults (n = 90) with rules of Latin morphosyntax, and asked them to identify these rules in Latin sentences (subject/object/verb). Afterwards, learners in the testing group saw Latin sentences that temporarily contained a blank that was to be filled-in mentally before the complete sentence appeared on the screen. For learners in the restudy group, the sentences did not contain a blank. Learning performance was assessed with fill-in-the-blank tests, 5 minutes and 48 hours after the testing/restudy phase. Results revealed a beneficial effect of testing. Interestingly, in contrast to studies observing testing effects in other domains, we observed a beneficial effect already in the immediate posttest, suggesting that differences between the two groups in our study do not mainly reflect differences in the forgetting rate of the rules.

Probing attentional adjustment

Mike Wendt
Medical School Hamburg, Faculty of Human Sciences
mike.wendt@medicalschool-hamburg.de

Attentional adjustment to varying context conditions is widely considered a means of executive control. Such adjustment is often inferred from modulations of congruency effects, that is, from variations in the size of the performance difference when target and distractor stimuli are associated with same response (i.e., congruent condition) compared to different responses (i.e., incongruent condition). This method has yielded various confounds with the sequence or the frequency of simple or abstract stimulus features or stimulus-response contingencies, allowing for alternative, non-attentional accounts. I will review methodological advances aimed at eliminating possible confounds, focusing particularly on a probe task approach, which is based on intermixing trials of a different task, designed to be sensitive to the assumed adjustment process.

Insights into embodied language: neural activity during body-related and emotional word processing

Christine Wiebking[1], Christina Ralph-Nearman[2] & Cornelia Herbert[1]
[1]Ulm University, Applied Emotion and Motivation Research; [2]University of Nottingham, School of Psychology
christine.wiebking@uni-ulm.de

Investigating neural activity during processing and evaluation of abstract stimuli like words is a topic of sustained interest in experimental psychology and cognitive neuroscience. Embodiment theories have proposed a close relationship between word processing and sensory, sensorimotor and affective processes in the brain. Whilst previous neuroimaging studies targeted brain regions involved in the processing of action or emotional words, the aim of the present functional magnetic resonance imaging (fMRI) study was to explore category-specific and category-unspecific semantic processing effects. Testing for modality-specific 'embodied' word processing (e.g., involvement of sensorimotor cortex in the appraisal of body-related words) and modality-unspecific semantic word processing, the influence of type of language, emotional and body-related content was investigated. Echo planar images with BOLD contrast were acquired (3-Tesla Siemens Magnetom Prisma) in healthy participants. The paradigm included positive/negative emotional vs. neutral words and body-related words (e.g., leg, arm) in German (first) and English (second) language. Preliminary results suggest differential neural activity in brain regions like the insula (including left and right posterior/anterior insula), medial brain regions (not belonging to semantic converging zones) and language-related temporal brain regions when processing emotional and body-related words in German and English.

Social Inhibition of Return in the interaction between Humans and Virtual Agents

Carolin Wienrich[1], Felix Kretschmer[2], Richard Gross[2] & Gisela Müller-Plath[2]
[1]University Würzburg, Institut Human-Computer-Media Team for Human-Technique-Systems; [2]Technische Universität Berlin, Institute for Psychology and Ergonomics, Chair for Methology and New Media
carolin.wienrich@uni-wuerzburg.de

Introduction. The well-known inhibition of return effect (IOR) does not only occur intrasubjectively (within-participant IOR) but is also found with one participant observing the response of another (between-participant IOR; Welsh et al., 2005). Skarratt, Cole and Kingstone (2010) coined the term social inhibition of return (sIOR), because they found that only a real conspecific could induce the inhibition effect in another person, whereas an animated conspecific could not. However, their animated participant was displayed as a video on a 2D-TV-screen, i.e. weakly immersive. In contrast thereto, the present study investigated the impact of a stronger immersive virtual partner on the sIOR phenomenon expecting the typical reaction time costs. Method. 22 participants conducted a mixed-reality experiment. Participants indicated their response on a real reaction table, which was exactly emulated in virtual reality. The interaction with the animated partner occurred in virtual reality. Prior to the experiment, the movements of the virtual agent were captured by motion tracking. Results. The results revealed a significant cost effect regarding reaction times ($t(21) = 3{,}390$, $p = 0{,}001$) and hence confirmed that a virtual partner can induce sIOR. Reasons for different results and implications for the design of interactions with animated conspecifics are discussed. Literatur Skarratt, P. A., Cole, G. G., & Kingstone, A. (2010). Social inhibition of return. Acta psychologica, 134(1), 48-54. Welsh, T. N., Elliott, D., Anson, J. G., Dhillon, V., Weeks, D. J., Lyons, J. L., & Chua, R. (2005). Does Joe influence Fred's action?: Inhibition of return across different nervous systems. Neuroscience letters, 385(2), 99-104.

Which information is diagnostic for efficient real-world scene categorization?

Verena Willenbockel[1], Sandro Wiesmann[1], Frédéric Gosselin[2] & Melissa L.-H. Võ[1]
[1]Goethe University Frankfurt, Department of Psychology; [2]Département de Psychologie, Université de Montréal
willenbockel@psych.uni-frankfurt.de

Real-world scenes contain a wealth of information potentially useful for categorization. Which information subsets do we rely on for quickly and accurately categorizing scenes at the basic level? Using the SF Bubbles technique, we investigated which spatial frequencies (SFs) observers use for fast and accurate categorization of indoor scenes (Experiment 1) and natural outdoor scenes (Experiment 2). In each experiment, observers viewed 800 images from four categories in random order. Images were SF filtered using randomly distributed Gaussian "bubbles" and displayed until observers' response. Observers' task was to press the spacebar as soon as they recognized the scene category, and upon stimulus offset, press the respective key for the correct category. Multiple linear regressions on the transformed RTs from the spacebar press and the respective filters revealed two SF bands: in Experiment 1, SFs around 3 cycles/image (0.50 cycles/degree) and around 28 cycles/image (4.67 cycles/degree) attained significance; in Experiment 2, SFs around 2 cycles/image (0.33 cycles/degree) and around 26 cycles/image (4.33 cycles/degree) were significant. Second-order analyses indicated that these significant "low" and "high" SFs were used conjunctively. Our results demonstrate that people utilize a combination of coarse and fine information for efficiently categorizing both indoor and outdoor scenes.

A new critical test for discrete-state models of change detection based on likelihood-ratios

Samuel Winiger[1], Henrik Singmann[1], David Kellen[2] & Klaus Oberauser[1]
[1]University of Zurich, Department of Psychology, Cognition Unit; [2]Syracruse University
s.winiger@psychologie.uzh.ch

There is an ongoing debate whether visual working memory is best described by continuous models (i.e., resource models) or discrete-state models (i.e., slot models). The goal of this study is to test a core aspect of discrete-state models for confidence-rating responses. Discrete-state models predict that the sign of the log-likelihood ratio of the responses switches from positive to negative at exactly the binary point of the confidence rating scale (i.e., the point between 'unsure change' and 'unsure same'). In a change detection task with an 8-point confidence rating scale we manipulated the base rates of change trials (25% change trials and 75% change trials) and measured the point where the log-likelihood sign switches. Two experiments were conducted to test this prediction. In Experiment 1 we used non-intrusion change trials. In Experiment 2 we used intrusion change trials (i.e., the test color of change trials was present in the learning set, but on a different item). We test the predictions on the posterior predictive distribution simulated from a hierarchical-Bayesian instantiation of the discrete-state model. Results provide evidence against the prediction of the discrete-state model in both experiments.

Transfer is possible – Drivers' benefit from a multi stage collision warning

Susann Winkler, Juela Kazazi & Mark Vollrath
Technische Universität Braunschweig, Institut für Psychologie, Abt. Ingenieur- und Verkehrspsychologie
susann.winkler@tu-bs.de

Driver assistance can increase traffic safety. As safety-critical situations can be diverse, integrated adaptive warnings (like a multi stage collision warning) need to be developed and examined in a variety of situations over time. This driving simulator experiment investigated a multi stage collision warning in diverse critical situations instead of one very specific use case. It adapts its output according to the drivers' behavior and comprises two warning stages (W1 – warning for moderate deceleration in less critical situations and W2 – urgent warning for strong and fast brake reactions in more critical situations). The driving behavior and subjective evaluations of twenty-four participants were measured in order to analyze whether drivers benefit from the assistance when allowed practice with it in partially repetitive trials of various critical situations (including a baseline without assistance, a learning phase with assistance and a transfer drive). The well accepted multi stage collision warning system can be recommended as beneficial in various critical situations. Drivers learn how fast and strong to brake with the assistance and can apply the gained knowledge from the learning phase to various new situations (transfer).

Valence-based asymmetries in attentional bias towards emotional faces in the general population

Benedikt Emanuel Wirth & Dirk Wentura
Saarland University, Department of Psychology
benedikt.wirth@uni-saarland.de

In three dot-probe experiments, we investigated whether emotional faces capture attention in unselected (i.e., non-anxious) samples. In Experiment 1, we conducted a dot-probe task with photographic angry and neutral face cues. The target display always contained a distractor and the target, which had to be selected and categorised. Two types of target stimuli were employed, socially meaningful targets (schematic faces) versus socially meaningless targets (scrambled schematic faces). Participants showed a reliable attentional bias towards angry face cues only when they were classifying socially meaningful targets. In Experiment 2, we investigated whether attentional bias towards happy faces is also contingent on socially meaningful target stimuli. We found an attentional bias towards happy faces that was, however, not moderated by the social characteristics of the target stimuli. To rule out the possibility that low-level stimulus confounds caused the attentional bias in Experiment 2, we conducted Experiment 3 employing inverted happy (and neutral) face cues. No attentional bias towards inverted happy face cues occurred. Thus, it seems that the general population shows an unconditional attentional bias towards happy faces, but that attentional bias towards angry faces is contingent on the activation of a social processing mode due to current task demands.

How Not to Fall for the White Bear: Flexible Control of Negation Processing

Robert Wirth, Wilfried Kunde & Roland Pfister
University of Würzburg
Robert.Wirth@uni-wuerzburg.de

Processing negated mental representations comes with a price: Negations are harder to resolve than affirmative statements, and they may invoke ironic effects, producing the exact opposite of the intended outcome. These negation effects also behave ironically when subjected to high- frequency training, when they are confronted often, the difficulty to process negations strangely increases. Here, we show that negation effects can be mitigated under certain circumstances. Based on conflict adaptation models, we hypothesized that negation effects diminish when two criteria are met: negations have to be resolved not only frequently, but also just recently. We confirmed this prediction by using an innovative, two-dimensional finger tracking design, in which we measured the influence of the original semantic content during negation processing. Negation effects were present throughout the experiment, but drastically reduced when a high frequency and recency were able to work in concert. The combined influence of frequency and recency thus seems to be the most successful and promising attempt to mitigate ironic negation effects on overt behavior.

Cognitive load influences performance, speech and physiological parameters in a multimodal dual-task setting

Maria Wirzberger[1], Robert Herms[2], Shirin Esmaeili Bijarsari[1], Günter Daniel Rey[1] & Maximilian Eibl[2]
[1]TU Chemnitz, Psychology of Learning with Digital Media; [2]TU Chemnitz, Media Informatics
maria.wirzberger@phil.tu-chemnitz.de

The prominent Cognitive Load Theory postulates distinct sources that contribute to overall cognitive resource demands in instructional settings. Based on this theoretical framework, the study provided insights into the progression and interaction of structural and process-related facets of cognitive load in a dual-task scenario. The tested sample of 123 student participants (M = 22.67 years, SD = 3.55, 76.42% female) learned easy or difficult combinations of geometrical symbols in a visual-motor primary task while memorizing five-digit number sequences from an auditory-verbal secondary task. Task complexity, representing intrinsic cognitive load, was manipulated by the number of symbols that formed a combination. Secondary task demands were regarded as situational constraints related to extraneous cognitive load. Participants' learning performance within each trial provided an assessment of schema acquisition, attached to germane cognitive load. In addition to participants' performance, relevant speech and physiological parameters were recorded continuously to monitor changes in cognitive resource demands. Results revealed increasing progressions of both primary and secondary task performance over the trials. Significant decreases in speech and physiological parameters indicate a reduction in the overall level of cognitive load with task progression. Theoretical and practical implications of the observed result pattern are discussed within the talk.

Striking individual differences in gloss perception

Christoph Witzel
Allgemeine Psychologie, Justus-Liebig-Universität
cwitzel@daad-alumni.de

Two new photos surged a buzz in the social media because the legs and the sandwiches shown in the photos were described as extremely glossy by some and as completely matte by others. We conducted two online surveys and an experiment in the laboratory to measure gloss estimations for the two photos and compared them to individual differences in the perception of other objects. Results established systematic individual differences in the gloss perception of the two photos that were related to age, but neither to gloss perception of other objects nor to colour and gloss perception of #theDress. Those individual differences depended on whether observers attributed the white areas on the legs and sandwiches to light reflections or to substances, such as paint or powder. When images were presented in a (20 times) larger size, observers rated the objects as less glossy. This observation highlights the role of fine-grained texture for gloss perception and it also explains the correlation with age. After observers had seen the larger versions of the images their gloss ratings remained low for the small images, suggesting an effect of insight. Taken together, these photos provide a new approach to study the determinants of perceived gloss.

Untersuchung expliziter und impliziter Kommunikationsformen zwischen Fußgängern und automatisierten Fahrzeugen

Claudia Witzlack, Luka-Franziska Bluhm, Sarah Schubert, Matthias Beggiato & Josef F. Krems
TU Chemnitz, Institut für Psychologie
claudia.witzlack@psychologie.tu-chemnitz.de

Kommunikation zwischen verschiedenen Verkehrsteilnehmern ist notwendig, um einen sicheren und störungsfreien Verkehrsfluss im komplexen System des Straßenverkehrs zu ermöglichen. Mit zunehmender Fahrzeugautomatisierung muss nicht mehr nur der Fahrer, sondern auch das Fahrzeug in der Lage sein, eine Situation mit Kommunikationsbedarf zu erkennen und sinnvoll zu lösen. In zwei experimentellen Studien wurden daher explizite, visuelle Kommunikationsmöglichkeiten am Fahrzeug, als auch das Abbremsen als informelles Kommunikationssignal untersucht. Es konnte gezeigt werden, dass explizite Signale mit einer guten Sichtbarkeit und eindeutigen text- oder symbolbasierten Handlungshinweisen zur Querung der Fahrbahn, positiv wahrgenommen wurden. Dennoch bleiben bei visueller Kommunikation Probleme bestehen, wie etwa die Sichtbarkeit und Lesbarkeit unter verschiedenen Licht- und Wetterbedingungen. Es wurde daher in einer zweiten Studie untersucht, inwieweit bzw. welche Parameter des Abbremsens eine implizite Kommunikation zwischen Fußgängern und automatisierten Fahrzeugen erlauben. Die Ergebnisse beider Studien werden im Hinblick auf Gestaltungsempfehlungen potentieller Kommunikationsmöglichkeiten für automatisierte Fahrzeuge diskutiert. Diese Studien wurden im Rahmen des Projektes „Kooperative Interaktion mit schwächeren Verkehrsteilnehmern im automatisierten Fahren“ (KIVI) als Teilprojekt des DFG-Schwerpunktprogramms 1835 „Kooperativ interagierende Automobile“ durchgeführt.

The influence of incentives on cognitive control: a developmental study

Marc Woirgardt, Nicola K. Ferdinand & Jutta Kray
Saarland University, Department of Psychology
wmaroi@yahoo.de

Developmental studies show that cognitive control continuously increases until early adulthood, while socio-emotional development reaches its peak in mid-adolescence. Therefore, mid-adolescence is assumed to be specifically sensitive to receiving incentives. To test this, we examined the influence of positive and negative incentives as well as the amount of incentives on age differences in cognitive control. To assess cognitive control, we applied a cued task-switching paradigm and analyzed mixing (performance on mixed vs. single task blocks) and switching costs (performance on switch vs. repeat trials). The impact of incentives was measured by comparing trials with cues signaling the potential for receiving high or low amounts of gains or losses, depending on participant´s response accuracy. We investigated 128 participants (age range=9-18 years) and found that mixing costs decreased with increasing age and were lower in high-gain than in low-gain trials, indicating higher engagement in maintaining and selecting task sets when anticipating high gains. Switching costs were age-invariant, but seemed to be sensitive to motivational valence, as we found a tendency for lower switching costs on gain than loss trials. In contrast to models about adolescent development, we found no evidence for an enhanced influence of incentives on cognitive control in mid-adolescence.

Choices induce subsequent inhibition of non-chosen target location and color

Christian Wolf, Anna Heuer, Anna Schubö & Alexander C Schütz
Philipps-Universität Marburg, Allgemeine und Biologische Psychologie
chr.wolf@uni-marburg.de

When making decisions between rewarded options, humans can maximize their payoff by choosing the option with higher reward. We recently showed that decisions between two rewarded targets delay subsequent responses to the non-chosen target (Wolf, Heuer, Schubö, & Schütz, 2017). Here, we explored if this inhibition only applies to the location of the target or also to other target features. We measured saccade latencies in response to single colored targets left or right from fixation. One target color was associated with a high, the other one with a low reward. Colors were independent of target locations and locations were thus not related to the decision. We manipulated the proportion of interleaved choices within a block (0 or 33%). During choices, both targets were displayed and participants could choose between them to obtain the corresponding reward. The influence of reward on single target latencies increased when choices were present. Depending on the stimulus configuration, we found inter-trial effects for color as well as location, although location was not informative about the reward. This suggests that choices not only inhibit decision-related but also decision-unrelated features.

User-adaptive human-machine interfaces: temporal sensitivity of electrodermal parameters

Elena Wolf & Barbara Deml
Karlsruhe Institute of Technology (KIT), Institute of Human and Industrial Engineering (ifab)
elena.wolf@kit.edu

In the context of human-machine-interfaces (HMI), bio-physiological signals like electrodermal activity provide a noninvasive technique to measure the user's mental workload without interrupting the workflow. The challenge for user-adaptive systems is to physiologically differentiate the time interval of high mental workload, e.g. in case of excessive demands, from the time intervals with low to moderate mental workload. With the aim of a low latency in the HMI, it is also necessary to specify which time window is sufficient to guarantee a valid prediction of mental workload. For this purpose, a laboratory experiment was carried out with 48 participants. Systematic variation of mental workload was operationalized through three computer-based ball tracking tasks, which steadily increased their difficulty level in fixed time intervals. In order to identify the state of high mental workload, participants were instructed to reduce the task difficulty level in case of subjective mental overload by pressing a key. Based on this support request, the electrodermal signal was divided into time intervals of 5, 10 and 20 seconds. Parameters for these intervals were statistically analyzed and compared in terms of their prediction accuracy for mental overload. Implications for the use of electrodermal parameters in adaptive HMI are discussed.

Response preparation with reliable cues decreases response competition in the flanker task

Peter Wühr[1], Christian Frings[2] & Herbert Heuer[3]
[1]TU Dortmund University, Department of Psychology; [2]Trier University, Department of Psychology; [3]Leibniz Research Centre for Working Environment and Human Factors (IfADo)
peter.wuehr@tu-dortmund.de

We tested the hypothesis that selective response preparation, based on reliable response cues, reduces or eliminates response conflict in an Eriksen flanker task. Previous studies of this issue produced inconclusive results because presenting a valid response cue before the actual stimulus display turns a choice-response task into a simple-response task, in which full processing of the stimulus display containing both the relevant stimulus and irrelevant stimuli, which trigger the response conflict, is no longer necessary. We conducted two experiments in which we matched stimulus processing in conditions without cues and with fully reliable cues as far as possible. In both experiments, we presented a nogo target stimulus in 25% of the trials. The different cueing conditions were presented in separate blocks in Experiment 1, but mixed within blocks in Experiment 2. In addition discrimination of the nogo target stimulus from the go stimuli was made more difficult in Experiment 2. The most important result was the reduction of response conflict as induced by incompatible flanker stimuli in both experiments with reliable response cues. This finding supports the notion of a negative preparation-interference relationship.

The aging lexicon: Differences in the semantic networks of younger and older adults

Dirk U Wulff[1], Thomas T Hills[2] & Rui Mata[1]
[1]University of Basel; [2]University of Warwick
dirk.wulff@gmail.com

Cognitive aging is often equated with cognitive decline. However, while fluid abilities, such as reasoning, working memory, and processing speed, decline, crystallized abilities rise. One variable that appears to particularly defy the common developmental trend is vocabulary size, showing performance increases into late adulthood. Based on this finding, it was recently demonstrated that the rise in vocabulary size, and crystallized abilities in general, may in parts be responsible for the decline in more fluid abilities. Building upon this hypothesis, we present evidence using a network-approach that older and younger adults' representations of words, also known as their mental lexicon, differ not only in size but also in structure. Moreover, I will show that these structural differences in the mental lexica of younger and older adults can be explained in terms of differences in the amount of experiences made by younger and older adults. In light of known connections between network structure and cognitive functioning, these results strengthen the view of cognitive decline being driven by extended learning, rather than cognitive or neuronal deterioration.

Stereotype Reliance in Source Guessing: State Versus Cognitive Trait?

Liliane Wulff & Beatrice G. Kuhlmann
University of Mannheim, Chair for Cognitive Psychology and Individual Differences (Psychology III)
lwulff@mail.uni-mannheim.de

People rely on prior knowledge (e.g., stereotypes) to guess the origin of information if they do not remember the actual source. In two experiments, we examined the stability and determinants of stereotype-based source guessing. In Experiment 1 (N = 207), participants worked on two distinct source-monitoring tasks using age-stereotypic item material, either separated by 10 minutes or seven days. In Experiment 2 (N = 72), participants worked on two distinct source-monitoring tasks using item material of different stereotype domains (age & gender). We used a Bayesian hierarchical multinomial processing tree model to estimate cross-task correlations of stereotype-based source guessing over time and across stereotype domains. Preliminary data analyses of both experiments suggest at best weak correlative evidence for cross-task stability. Individual parameter estimates of source guessing were predominantly constant over time (E1) and across stereotype domains (E2). Other source-monitoring parameters, old-new guessing and item and source memory, indicated stability. Stereotype reliance in source guessing could not be explained by personality trait scores (Big Five, Need for Cognition, Faith in Intuition). We discuss the results with regard to their interpretation of stereotype-based source guessing as a stable cognitive trait or fluctuating state.

Credit Assignment and Reinforcement Learning in Environments with Multiple Feedback

Franz Wurm, Benjamin Ernst & Marco Steinhauser
Catholic University of Eichstätt-Ingolstadt
franz.wurm@ku.de

In many situations, links between actions and corresponding outcomes are not necessarily clear and obvious for the decision maker. Especially in probabilistic and volatile environments, this credit assignment problem arises from insufficient information on environmental contingencies. In the present study, we investigated the mechanisms capable of solving the credit assignment problem in a reinforcement learning framework. We employed a probabilistic learning task with multiple independent stages. While decisions on each stage were rewarded separately, color-coded feedback stimuli for each decision were presented in parallel without explicitly indicating which feedback color was linked to which decision. Afterwards, a transfer devaluation task was employed, which could only be solved, when decision-feedback associations were established during the learning task. As predicted, findings from both learning task and transfer task clearly indicate successful credit assignment. Interestingly, emerging decision-feedback associations were not bound to resemble the environmental contingencies. Computational models of reinforcement learning were used to further elucidate the mechanisms underlying (mal)adaptive credit assignment.

Content and temporal event knowledge of elderly people

Michelle Wyrobnik[1], Elke van der Meer[2] & Gesa Schaadt[3]
[1]Humboldt-Universität zu Berlin, Institut für Psychologie, Kognitive Psychologie; [2]Humboldt-Universität zu Berlin, Institut für Psychologie, Seniorprofessur Kognitive Psychologie; [3]Max-Planck-Institut für Kognitions- und Neurowissenschaften, Abteilung Neurologie
michelle.wyrobnik@hu-berlin.de

The present study aimed to investigate the processing of content (knowledge about the sub-events that belong to an event) and temporal (knowledge about the temporal order of the subevents within the event) event knowledge in healthy elderly adults compared to younger adults by analyzing ERPs that are related to event knowledge processing (e.g. N400 and P600 components). For both groups responses were analyzed either to correctly presented event sequences or to event sequences that contained a content or temporal error. Both groups showed similar ERP responses: In response to content errors in event sequences, both groups showed a N400, indicating a mismatch reaction to the presented erroneous events and the established event model in working memory, and a posteriorly distributed P600, indicating a failed attempt to integrate the presented events into a new event model. In response to temporal errors in event sequences, both groups showed no N400 but an anteriorly distributed P600, indicating that both groups reorganized the presented events into the right temporal order and succeeded in integrating the reorganized events into a new event model. The present study shows, that event knowledge processing is preserved in aging, as older adults showed similar performances as younger adults.

Investigating the Influences of Time to Collision and Closing Speed on Driver Uncertainty in Lane Change Maneuvers

Fei Yan[1] & Martin Baumann[2]
[1]OFFIS- Institute for Information Technology; [2]Ulm University
yan@offis.de

Driver uncertainty during lane changes can induce long reaction times and potentially lead to dangerous crashes, which has not been studied before. This paper aims to investigate driver uncertainty during lane change decisions under influences of time to collision (TTC) and closing speed. A driving simulator study was conducted with 29 participants, where TTC and closing speed between a subject vehicle and an approaching car were varied within participants. Participants had to decide if a lane change to the left would be safe or not in a given traffic situation triggered by an acoustic signal. Reaction times, subjective uncertainty scores and action proportions for lane change decisions were recorded. The results show that both TTC and closing speed have significant effects on reaction times, uncertainty scores, and response actions for lane change decisions. Furthermore, closing speed has more influences on uncertainty scores than TTC. It means that when an approaching vehicle drives faster, longest reaction times, lowest subjective uncertainty scores and the majority of decisions for changing the lane appear earlier with short TTCs. Besides, reaction time is significantly negatively correlated with uncertainty score, which means that the more uncertain drivers are, the longer participants take to respond.

How do we distinguish between emotions? Analysing the kinematics of emotional interactions

Adam Zabicki, Julia Bachmann & Jörn Munzert
Nemolab – NeuromotorBehavior Laboratory, Justus-Liebig-University Giessen
adam.zabicki@sport.uni-giessen.de

The ability to recognise emotional states when observing social interactions can be assessed with a wide range of laboratory stimuli, such as static or dynamic faces and bodies, presented on a computer screen. It has been shown that even solely kinematic information, e.g. point-light displays, are sufficient for an accurate identification of emotional states. However, so far it has not been systematically investigated which kinematic parameters are critical in the process of distinguishing between emotions when observing emotional interactions. In the present study, we recorded emotional scenes, displayed by two non-professional actors, which differed in emotional content (anger, happiness, love, sadness) and intensity (high, medium, low). A validation study showed high performances in emotion recognition. We analysed several interaction-specific parameters (e.g. interindividual distance or hand movements) and tested whether these parameters differ between emotions and intensities. Results revealed emotion dependent differences in several parameters. For instance, the spatial distance between persons is significantly smaller in the love interaction condition. Moreover, the covered distance by the actor's hands is smaller in love and sad interactions compared to angry and happy interactions.

Mental and Manual Rotation of Physical Three-Dimensional Objects

Stefanie Zander[1], Stefan Brandenburg[2] & Elisabeth Brandenburg[1]
[1]Fraunhofer Institut für Produktionsanlagen und Konstruktionstechnik, Virtuelle Produktentstehung, Modellbasiertes Entwickeln; [2]Technische Universität Berlin, Cognitive Psychology and Cognitive Ergonomics
stefan.brandenburg@tu-berlin.de

In 1971 Shepard and Metzler firstly developed a rotation task showing that people are able to mentally rotate objects. Since then several experiments investigated the relationship of participants' reaction time with the objects' angle of rotation by using modifications of Shepard and Metzler's task. Yet all experiments presented their stimuli on a display. The present study, in contrast, used physical three-dimensional objects instead. The participants' task was to either mentally or manually rotate one of two different physical objects (pyramid or L-form) in order to decide whether it differs from the respective reference object or not. In addition, task complexity (high or low) and angle of rotation were varied. Participants' reaction times, errors and pupil diameter as measures of mental workload were assessed. The results, for example, revealed effects of type of rotation (mental or manual) on the dependent variables. Manual rotation led to significant lower error rates and less mental workload. The object type effected reaction types and error rates. Differences in task complexity affected participants' reaction time and error rates, but not mental workload. The findings suggest that manual rotation might be less demanding than mental rotation and that stimulus complexity effects mental rotation performance.

Unconscious processing of numbers: How important is the response format?

Iris Zerweck, Sascha Meyen, Florian Friedrich, Klara J. Grethen & Volker H. Franz
University of Tübingen, Experimental Cognitive Science
iris.zerweck@uni-tuebingen.de

To evaluate unconscious processing of numbers, we used a classic priming paradigm: In a 'direct' task, participants classified a masked 'prime'-stimulus (i.e., decided whether it is a number larger or smaller than 5). In this task, participants typically perform close to chance, suggesting no conscious awareness of the prime. In an 'indirect' task, the masked prime was also presented, but participants responded to another stimulus (decided whether that number was larger or smaller than 5). Typically, the prime has effects on reaction times in the indirect task, which is usually interpreted as preserved unconscious processing of the prime. However, this paradigm could be problematic, because participants are restricted to a binary response in the direct task. To assess whether participants have access to a richer, continuous representation of the prime in the direct task, we had 12 participants give a binary response and also judge their confidence on a continuous scale. We found that confidence modulated the accuracy of prime detection: Overall accuracy (mean+/-SEM): 58.6%+/-1.4%; accuracy in high/low-confidence trials: 64.4%+/-2.1% / 53.5%+/-1.1%, respectively. We will discuss to which degree this effect could be exploited to improve the response format in such paradigms.

Emotional Influence on Context-Specific Proportion Congruent Effect: Neutral or Emotional Facial Expressions as Context Stimuli

Jinhui Zhang, Andrea Kiesel & David Dignath
Department of Psychology, University of Freiburg
jinhui.zhang@psychologie.uni-freiburg.de

The context-specific proportion congruent (CSPC) effect refers to the phenomenon that congruence effects assessed, for example, in a Flanker task diminish in contexts associated with a high proportion of incongruent trials compared to contexts associated with a low proportion of incongruent trials. With the current experiment, we aimed to assess emotional influences on the CSPC effect. We presented either neutral or emotional facial expressions as context stimuli in a letter Flanker task. To reproduce the CSPC effect, we associated mostly incongruent trials with either male or female faces for the neutral-context group and associated mostly incongruent trials with either angry or happy faces for the emotional-context group. To assess general influences of emotions, we compared the size of CSPC effects between the neutral-context group and the emotional-context group. To assess valence-specific influences of emotions, we compared the size of CSPC effects—for the emotional-context group only—between participants for whom mostly incongruent trials were associated with angry faces and participants for whom mostly incongruent trials were associated with happy faces. Results showed no evidence of emotional general or valence-specific influences on the size of CSPC effects.

Influence of segmentation of subsequence help sequence learning in multitasking

Fang Zhao[1], Robert Gaschler[1], Eva Röttger[2] & Hilde Haider[2]
[1]FernUniversity in Hagen, Psychology; [2]University of Cologne
fang.zhao@fernuni-hagen.de

After replicated the previous research of Vaquero et al. (2006), we did not observe sequence learning when each block contains 10 repeated training sequences with 12 elements (second-order sequence) and 2 deviant sequences. Lozano, Hard & Tversky (2006) let participants perform real-life assembly tasks and found participants learned the task better through segments. We thus aimed to examine whether segmentation of subsequence can help sequence learning in multitasking. An experiment was conducted. Group 1 (N = 27) learned the sequence WITH segmentation. They learned the second-order sequence in two packages (e.g. Package A: 1-2-3-4; Package B: 3-2-1-4). They received these two packages in the first 3 blocks randomly. Then we showed them the complete sequence in block 4-6, then deviant sequences in single tasking condition and dual tasking condition. Group 2 (N = 27) conversely learned the sequence WITHOUT segmentation. They were trained with the repeating sequences first and then deviant sequences. Results showed no difference of reaction times between Group 1 and Group 2. Sequence learning occurred in Group 1 (with segmentation) and in Group 2 (without segmentation) only in single tasking.

Differential effects of distractions and interruptions on task performance. An EEG study using a continuous number task

Bianca Zickerick, Kristina Küper, Sven Thönes, S. Oliver Kobald & Edmund Wascher
Leibniz Research Centre for Working Environment and Human Factors
zickerick@ifado.de

Negative effects of interruptions and distractions on cognition are well documented. However little is known about the mechanisms underlying these two types of interference. In an EEG study, we examined the impact of interruptions and distractions on the performance of younger adults in a continuous number task. In this task, a random sequence of single digits (1 to 6) was presented. Participants had to either decide whether the current digit (N0; no load) or the sum of the current and the preceding digit (S-1; high load) was odd or even. Additionally, participants had to ignore single letters (distractions) or react to single letters (interruptions) that were randomly presented on 25% of all trials in different blocks. Surprisingly, in the S-1 condition, both accuracy and reaction times were significantly improved on trials following a distraction. Sustained frontal negativity indicated that the preceding digit was successfully maintained in working memory during distraction. Interruptions were more disruptive. In trials following an interruption, less frontal negativity as well as a lower P3b indicated higher working memory load due to the interruption. Our results suggest different neural mechanisms for the processing of interruptions vs. distractions in tasks involving high cognitive load.

Take it easy: Using cumulative prospect theory to understand the influence of option complexity on age differences in risk attitude

Veronika Zilker & Thorsten Pachur
Max Planck Institute for Human Development, Center for Adaptive Rationality
zilker@mpib-berlin.mpg.de

It has often been concluded that in decisions under risk older adults are more risk averse than younger adults. This conclusion is based on the finding that older adults are more likely to choose safe over risky gains. However, safe outcomes may be especially attractive to older adults because they are easier to process than risky options that require integrating several probabilistic outcomes. We show that when differences between options in complexity are experimentally controlled for, the apparent age differences in risk attitude disappears. Therefore, the frequently claimed increase in risk aversion in older adults may be largely due to confounded stimulus material. Using cumulative prospect theory (CPT) we examine the cognitive mechanisms underlying the impact of option complexity: CPT's weighting function becomes more linear when complexity is controlled for, and this effect is particularly strong in older adults. Further, controlling for option complexity decreases age differences in utility distortion, making CPT's value functions similarly nonlinear in both age groups. Finally, response noise in the decision making process increases under higher complexity. This, however, affects older adults and younger adults alike.

Perceptual Fluency, Metacognitive Beliefs, or Both – What Drives the Effect of Font Size on Judgments of Learning?

Malte F. Zimdahl & Monika Undorf
University of Mannheim, Department of Psychology
malte.zimdahl@psychologie.uni-mannheim.de

People think that they will remember words printed in a larger 48 point font better than words printed in a smaller 18 point font, as revealed by judgments of learning (JOLs). However, actual memory performance is usually unaffected by this manipulation. Recent evidence suggests that the font size effect on JOLs is based on people's beliefs about how font size affects memory performance. The current study tested whether perceptual fluency would contribute to the font size effect when font sizes differed more in perceptual fluency than 48 and 18 point fonts. We therefore manipulated font size between 6 point and 500 point. In four experiments, perceptual fluency – measured as response times in a lexical decision task – was lower for very small and very large font sizes than for intermediate font sizes. In contrast, JOLs increased monotonically with font size. This suggests that metacognitive beliefs rather than perceptual fluency underlie the font size effect on JOLs. Additionally, recall performance was better for large words. Thus, there is some justification for the belief that large font sizes help memory.

A systematic comparison of the performance with different fingers in softness discrimination

Aaron Cedric Zöller & Knut Drewing
Justus-Liebig-Universität, Allgemeine Psychologie
aaron.zoeller@psychol.uni-giessen.de

Haptic softness discrimination has been studied for different types of exploration behavior like pressing, squeezing or tapping, but is usually limited to behavior that can be derived from the exploration procedures described by Lederman and Klatzky (1987). For example, in studies that investigate softness discrimination with one finger participants are typically instructed to use their index finger. Performance with the other fingers is rarely investigated. However, Katz (1925) observed that in spontaneous exploration people prefer to use middle or index fingers. We wondered whether fingers differ in their ability to discriminate softness. In the present study we systematically compared thresholds when exploring with one of the four fingers of the dominant hand. According to our hypothesis, discrimination thresholds should be smaller for index and middle finger as compared to ring and little finger. In each trial participants compared the compliance of two different rubber stimuli. We used a 2AFC discrimination task combined with the method of constant stimuli. We kept the forces that were applied to the stimuli constant and controlled the number of indentations. Results indicate that performance varies with the exploring finger in unexpected ways. We will discuss the results in terms of optimal exploration behavior.

A direct comparison of evolutionary-relevant and modern stimuli in visual search – Does fear have an advantage at all?

András Norbert Zsidó[1], Orsolya Inhóf[2], Gergely Darnai[3], Árpád Csathó[4], Andras Matuz[4], Beatrix Lábadi[2] & Laszlo Bernath[5]
[1]University of Pécs; [2]Institute of Psychology, University of Pécs; [3]Institute of Psychology, University of Pécs; Department of Neurology, University of Pécs, Medical School; MTA-PTE Clinical Neuroscience MR Research Group; [4]Department of Behavioural Sciences, University of Pécs; [5]Faculty of Education and Psychology, Eötvös Loránd University
zsido.andras@pte.hu

Large body of research investigated whether there is an automatic attentional procession that favours threatening stimuli over non-threatening. However, the classical visual search paradigms have been met with criticism. Thus, we propose a new paradigm using real-life scenes to improve ecological validity. Participants had to find different objects (four categories: neutral or threatening and evolutionary-relevant or modern) presented on different backgrounds (evolutionary-relevant or modern), in two spatial positions (close to fovea or the periphery). They responded using touch-screens. In Experiment 1, we compared snakes and guns (threatening evolutionary and modern, respectively) to cats and pens. In Experiment 2, we included more objects per stimulus category (three instead of one). All images used were controlled for possibly confounding low-level visual features such as contrast, frequency, brightness, and image complexity. In Experiment 1, threatening targets were found faster compared to neutral cues irrespective of the evolutionary relevance. In contrast, in Experiment 2, threatening targets had no advantage over neutral ones. Interestingly, the type of background, and position of the stimuli only affected the detection of neutral targets. We claim that our results mean that some stimuli might be more strongly associated with threat than others thus having an advantage in visual search.

Intuition and Rationality – (Dis-)Fluency in Economic Trust Games

Michael Zürn
University of Cologne, Social and Economic Cognition II
michael.zuern@uni-koeln.de

Cooperation and exchange generally are beneficial for all involved parties. However, such interactions also entail the risk of betrayal and exploitation. Therefore, prospective interaction partners need to trust each other in order to realize the benefits of cooperation. Similar to expectations in general, trust in particular may be based on extensive information about a potential partner but also on decision makers' intuitions. Existing theoretical frameworks explaining the psychological dynamics of intuitive judgments assign a prominent role to processing fluency. There, fluency elicits positive affect which may lead to positive judgments about another person's characteristics (e.g. trustworthiness). At the same time, experiencing disfluency may also be a cue to infer competence. As such, disfluency may also trigger economic rationality which often commands to distrust others. Therefore, either fluency creates trust or disfluency creates distrust. To address these opposing hypotheses, we use different variations of economic Trust Games. In detail, we use the names assigned to the players as vehicles to induce experiences of articulatory fluency while varying the payoff structure of the games. In this talk, I will overview the findings from a series of experiments (N > 1000) and discuss the empirical validity of both theoretical accounts.

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