

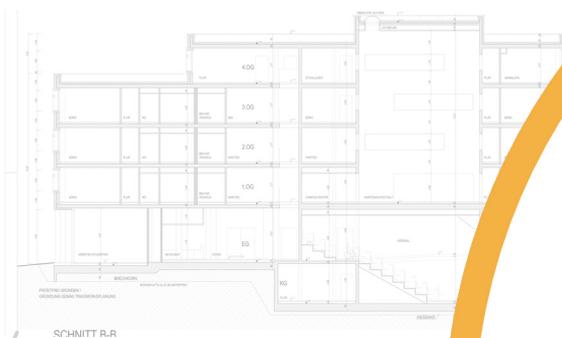
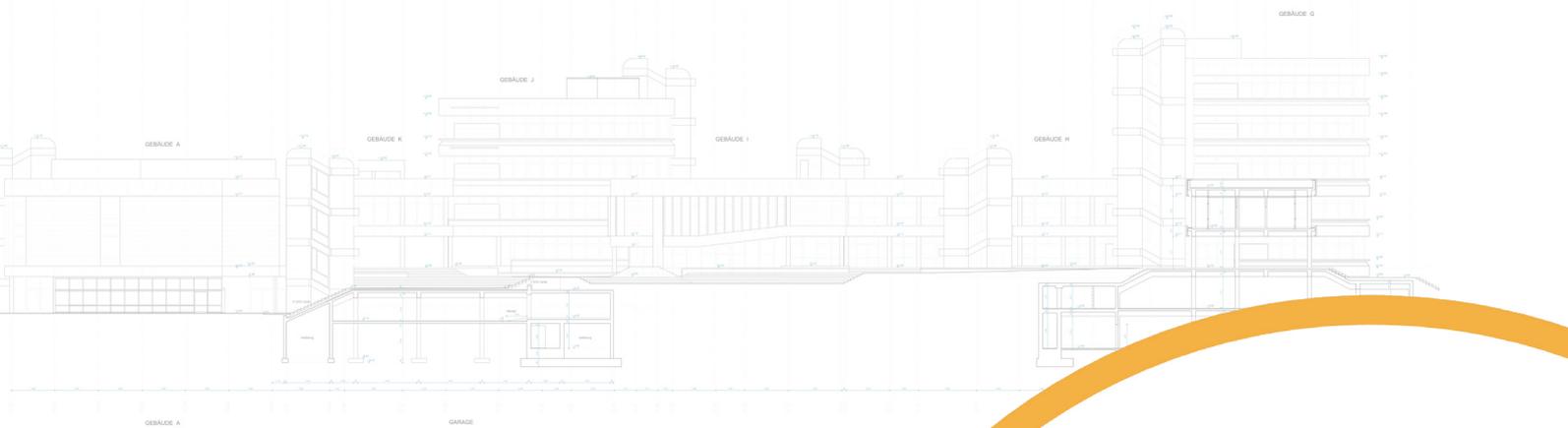
# TeaP 2015



## HILDESHEIM

# Abstracts

of the 57th Conference of Experimental Psychologists



edited by  
Christina Bermeitinger  
Andreas Mojzisch  
Werner Greve



# **Abstracts**

of the 57<sup>th</sup> Conference of Experimental Psychologists

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# Keynote lectures

## Decoding thoughts from brain imaging signals: What does(n't) this mean for experimental psychology?

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In recent years it has become possible to decode a person's thoughts by applying classification techniques to brain imaging signals. Even though a "universal thought reading machine" is still science fiction, considerable progress has been made in decoding such diverse mental states as visual percepts, unconscious representations, memories, intentions, action plans and emotions. This talk will give an overview of this research field, along with a discussion of the main successes, but also of the challenges, limitations and ethical concerns. Importantly, the implications of brain reading for experimental psychology will be highlighted. A severe limitation in training mental state classifiers lies not only in the limited resolution of neuroimaging signals, but also in the limitations of introspective techniques. Furthermore, despite a number of potential neurotechnological applications, mental state decoding is unlikely to replace standard psychological techniques for probing a person's thoughts in the near future.

## Understanding the Mind by examining the Brain

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Most research in psychology and economics makes inferences about the human mind on the basis of behavioral data. The development of noninvasive imaging and brain stimulation techniques, however, offers the promise of a deeper understanding by combining brain data with behavioral data. We illustrate this potential of brain research by designing an experiment in which different motives drive behaviorally equivalent altruistic acts. Because the altruistic behaviors are behaviorally equivalent, behavioral measures of altruism are – by definition – incapable of discovering the underlying motives. We show, however, that the connectivity patterns of brain data help us predict the different motives with high accuracy. In addition, the brain data provide important insights into the nature of altruistic motives such as empathy and reciprocity. We also show that neural measures of altruistic preferences outperform behavioral measures in out-of-sample predictions of altruistic behaviors. If we add the neural measure as an explanatory variable, the explained variance in out-of-sample predictions greatly increases and the behavioral measure becomes insignificant.

# The (dis-)unity of implicit and explicit theory of mind

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The most pressing question in recent theory of mind research is how to square two sets of findings: on the one hand, a huge body of evidence from traditional explicit tasks revealing competence at ascribing false beliefs and related propositional attitudes around age 4, and on the other hand new findings from more implicit tasks that suggest some competence dramatically earlier. Two-system-theories aim at resolving this tension in the following way: they claim that the capacities tapped in early implicit tasks are fundamentally different conceptual capacities (subserved by System 1) from those tapped in explicit tasks (subserved by System 2) (Apperly & Butterfill, 2009). System 1 is early-developing, fast, and relatively independent of central cognitive resources such as executive function. However, it is inflexible and has well defined signature limits: it allows the tracking of belief-like states but not of beliefs proper, and level-I but not level-II perspective-taking. System 2, in contrast, is flexible, dependent on central resources (language, executive function) and allows for the ascription of beliefs and other propositional attitudes proper. In this talk, I will present recent findings from our lab that speak in favor of the 2-systems account: Children from age 2 to 5 were confronted with implicit and explicit versions of false belief tests with varying form and content. Basically, the results suggest that the early precocious capacities tapped in implicit tasks show clear signature limits. Toddlers' performance thus reveal a striking dis-unity in that only some false belief tasks with a narrow range of topics and form are mastered. The performance of older children in explicit tasks, however, shows an even greater unity than previously assumed. When suitably modified, the performance of 4- and 5-year-olds on diverse false belief tasks that had dissociated in previous research turned out to be equally difficult and strongly related.



# Symposia

## **SYMPOSIUM: Kognition und Emotion in der Mensch–Technik–Interaktion**

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Die zunehmende Verbreitung digitaler Systeme in unserem Alltag verändert die Art wie wir unsere Umwelt wahrnehmen und mit ihr interagieren. Gegenstand dieses Symposiums ist die Untersuchung der Auswirkung und Bedeutung verschiedener technologischer Einflussgrößen auf das Erleben und Verhalten des Menschen. Die Beiträge beleuchten dabei eine Vielzahl unterschiedlicher Kontexte und psychologischer Aspekte der Mensch–Technik–Interaktion. Der Beitrag von Trapp und Pohl nutzt das Paradigma der visuellen Suche zur Analyse der optimalen Gestaltung von Smartphone–Icons. Bei Minge, Wagner und Thüring bzw. Bürglen steht der Einfluss von Technik auf ältere Nutzer im Mittelpunkt, insbesondere in Bezug auf sozial–emotionale Komponenten wie z. B. positive Emotionen. Sicherheits– und Vertrauensaspekte moderner Technologien werden im Beitrag von Bär und Furnell beleuchtet, der sich mit den Anforderungen von Passworrichtlinien auf Webseiten befasst. Der Beitrag von Becker, Backhaus und Schwaninger befasst sich mit den besonderen Arbeitsanforderungen von Sicherheitskontrolleuren an Flughäfen und deren Auswirkungen auf die Leistung. Der Beitrag von Fricke und Kollegen beleuchtet die Fahrer–Fahrzeug–Interaktion und bezieht sich insbesondere auf den Einfluss moderner Automations– und Assistenzsysteme. Die verschiedenen Beiträge zeigen, dass es eine Vielzahl von Möglichkeiten für den Einsatz kognitionspsychologischer und emotionspsychologischer Grundlagen und Befunde gibt um Technik effektiv und nutzerfreundlich zu gestalten.

**SYMPOSIUM: Effects of healthy aging on attentional and cognitive control  
as revealed by event related brain potentials**

Stefan Berti<sup>1</sup>, Stephan Getzmann<sup>2</sup>

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Demographic change poses a major challenge for western societies. The mechanisms underlying age-related changes in cognitive functioning have therefore become the focus of a general research interest. Importantly, in recent years the focus shifted from the view that aging was regarded as a type of neuro-degenerative process to the effects of healthy aging as a central aspect of lifespan development. Substantial progress in the understanding of healthy aging was achieved due to the application of event-related brain potentials (ERPs). The symposium will summarize recent results on the influence of healthy aging on attentional and cognitive control: Stefan Berti will report age differences in automatic change detection as a basis of effective behavioral adaptation in dynamic environments. Tina Schwarzkopp and colleagues will present a study of aging and visual working memory and ERP evidence for an age-specific delay in filtering. Tina Möckel and colleagues will address age-related effects of mental fatigue. Hannah Schmitt and colleagues will focus on influences of motivation on cognitive control and on differential incentive effects in younger and older adults. Finally, Stephan Getzmann will address age-related issues of speech processing under dynamic “cocktail-party” conditions.

**SYMPOSIUM: Cognitive Control**

Nicola Kristina Ferdinand

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Cognitive control has been generally defined as the ability to guide thoughts and actions in accord with external and internal task goals. This ability is required when we need to flexibly adapt to changes in our environment. It involves the switching and selection between multiple tasks, the maintenance of task-relevant and the inhibition of task-irrelevant information, as well as monitoring for error and conflict information and processing of feedback. This symposium wants to address different environmental variables, as well as emotional and motivational factors that possibly influence our ability to exert cognitive control. Specifically, the presentations are going to deal with the question of whether task complexity or uncertainty modulate our brain's ability to monitor the environment and to exert cognitive control during task switching. We also investigate whether experimentally induced positive or negative mood can influence feedback processing. Additionally, we are interested in age-related changes in these cognitive processes and whether motivational factors, like a motivating game setting, can enhance the outcome of a cognitive control training in middle-aged children.

## **SYMPOSIUM: The Reproducibility Project: Estimating the Reproducibility of Psychological Science**

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Reproducibility is a defining feature of science. However, because of strong incentives for innovation and weak incentives for confirmation, direct replication is rarely practiced or published. The Reproducibility Project is an open, large-scale, collaborative effort to systematically examine the rate and predictors of reproducibility in psychological science administered by the Open Science Collaboration (OSC). Since forming in November 2011, the project has involved more than 260 volunteer researchers from over 70 institutions conducting more than 114 replications of studies published in their prominent psychological journals in 2008. As an open Project, new contributors join and additional replications begin each month. Representatives of the OSC will present the motivation for the project, an overview of the research design, an interim report of the results, the implications of the results for psychological science. A better understanding of reproducibility will improve confidence in scientific methodology and findings.

## **SYMPOSIUM: A Multimethod Approach to Measure Risk-Taking Behavior**

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Risk-taking preferences have traditionally been assessed by means of monetary lotteries. Based on the observed choices, researchers could gauge participants' willingness to take risks. More recently, however, alternative approaches to measure risk taking have been established, including decomposing the observed behavior in laboratory tasks by means of cognitive modeling, assessing risk taking in real-life situations such as in traffic, identifying the neural correlates of risk taking by means of neuroimaging studies, or using large-scale surveys to examine risk-taking propensities in representative samples, which allows investigating shifts across the life-span (to mention just one example). The Basel-Berlin Risk Study comprises such a multimethod approach to assess risk-taking behavior with a sample of 1,500 participants. In this symposium, we present the core projects of this study as well as related projects that make use of these different methodologies. Then, a discussant will assess the implications of the findings, review the challenges and opportunities of the different methodologies, and discuss the importance of a multimethod approach for advancing our understanding of risk taking.

**SYMPOSIUM: Social Influence on Decision-Making: Recent Findings from  
Neuro-cognitive, Developmental and Animal Research**

Markus Germar

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One of the most fundamental questions in social psychology is which cognitive processes mediate social influence on decision-making and how these processes are shaped by motivational or developmental factors. In our symposium we bring together recent findings that address this question. On the basis of a diffusion model analysis, the first talk will summarize evidence from multiple experiments testing whether social influence can induce a perceptual bias and how informational versus normative influence contributes to this effect. The second talk will integrate evidence from event-related potentials and a diffusion model analysis to uncover the time course of this perceptual bias. Differentiating between low versus high autonomous participants, the third talk will present evidence supporting the idea that early visual processing is more altered in the former group. The fourth talk will summarize evidence showing that social influence can lead to superficial structural encoding of faces indicated by the N170. In the fifth talk, we will turn to a developmental perspective. Over different age groups, we show a developmental increase in reported perceptual bias in favor of social advice. Finally, the last talk will report evidence from a study testing whether dogs stick to their learned behavior or follow their conspecifics.

**SYMPOSIUM: The binding mechanism: Recurrent themes and new insights**

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Responding to a stimulus results in short lived bindings between stimulus- and response features that are integrated in a so called event file (Hommel, Müsseler, Aschersleben, & Prinz, 2001). Repeating any part of an event file on a later occasion can influence subsequent responding via retrieval of other integrated parts. Effects of stimulus-response (S-R)-binding and retrieval, which play a dominant role for the automatic, stimulus-based control of behavior, have been widely investigated for the last two decades. To date, a burgeoning amount of evidence documents that principles of S-R binding and retrieval are pervasive and apply to a broad scope of stimuli, responses, and modalities. However, despite the vast increase in our understanding of the mechanisms and scope of S-R binding and retrieval processes, several issues remain unresolved to date. These for instance concern questions regarding the automaticity of the binding process, its influence on decision making, the relation between short- and long-term associations as well as its relation to other influential effects and experimental paradigms (e.g., task switching, negative priming, etc.). The present symposium aims to collect recent findings that reveal new insights into these questions, and provides and in-depth discussion of their implications.

## **SYMPOSIUM: Language and Emotion: More than just words**

Cornelia Herbert<sup>2</sup>, Johanna Kissler<sup>1</sup>

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We post, blog, chat, twitter and tweet. Social media is increasingly dominating communication behavior and affecting the way we verbalize our emotions. This symposium discusses how emotions are decoded from written words in social interactions and investigates the extent to which these processes are influenced by contextual factors including perceived sender–observer relationship on the one hand and embodied processes on the other. Firstly, neurophysiologic data will be presented showing that words related to the reader’s own emotion re–enact emotional and motivational systems in the brain and the body differently from words describing other people’s emotions. Secondly, it will be shown that our semantic interpretations take into account observed facial expressive behaviors and that semantic autobiographical information shapes the perception of faces in our brains. The self–reference of a message, the communicative context in which it is embedded, the anticipation of a real sender or a virtual other can affect the affective quality of simple words and influence their attention capture in visual and semantic brain processing regions. Together, the results confirm that the relationship between language and emotion is embodied and socially embedded. The consequences of this “social embodiedness” of language can be explained from neuroscientific and psychological viewpoints.

## **SYMPOSIUM: Group Performance and Collective Decision–Making**

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Current group performance and collective decision making research is set out for new shores and accordingly characterized by the following developments: (i) differentiation between the individual and group level, (ii) focus underlying processes in addition to outcomes, (iii) realization that groups can both, fall short of and exceed reasonable potential productivity baselines (generate process losses and gains), (iv) embedment of studies in frequent conditions of everyday life (including altered mental states such as sleep–deprivation or alcohol intoxication), and (v) overcoming paradigmatical constraints. The contributions of the proposed symposium closely reflect these developments. Burtscher et al. study group–level effects of regulatory focus theory – a theory that has hitherto only been investigated at the individual level. Schultze et al. probe groups’ rationality in advice–taking and illuminate when groups take less advice and come to more accurate decision than individuals. In one of the first studies on sleep–deprivation and decision making, Häusser et al. analyze advice–taking behavior of sleep–deprived participants. Mojzisch et al. introduce a new theoretical account for the sampling–bias in group–decision making and systematically test it. Hüffmeier and Schultze finally focus on group members’ compensatory motivation following incidences of unintentional group norm violations – a previously uninvestigated motivational phenomenon in groups.

## **SYMPOSIUM: Cognitive Modeling in Memory and Decision Making**

David Kellen<sup>1</sup>, Thorsten Pachur<sup>2</sup>, Henrik Singmann<sup>3</sup>

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Formal modeling has a long tradition in psychology (e.g., Estes, 1950). But only recently has this approach become popular and widespread to study the cognitive processes underlying behavior (e.g., Busemeyer & Diederich, 2009; Lee & Wagenmakers, 2013; Lewandowsky & Farrell, 2010). The increasing use of formal modeling in cognitive psychology has been accompanied by a recent flurry of developments of methods, philosophies and techniques. This symposium aims to provide an overview of the range of current modeling approaches by bringing together recent work from two important (and closely related) areas of psychology: Memory and decision making. The research in both areas share common problems and goals that make this type of gathering particularly timely and relevant. Given the breadth of the intended perspective, the symposium is planned as a two-part event, with each part including 5–6 contributions. The first part will feature work from the field of memory; the second part focuses on decision making. To encourage a constructive discussion among the modeling approaches, the symposium will be concluded by comments from Christoph Klauer.

## **SYMPOSIUM: Neurocognitive Approaches to Decision Making**

Patrick H. Khader<sup>1</sup>, Thorsten Pachur<sup>2</sup>

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Judgment and decision making have been investigated mainly with behavioral measures. However, in recent years more and more studies include neurophysiological methods, especially functional magnetic resonance imaging, to inform these processes from a neuroscience perspective. Our symposium presents a selection of these innovative attempts to show that the inclusion of neuroscience methods can bring about fascinating insights into the mechanisms underlying judgment and decision making. The studies by Gluth, Fechner, and Khader investigate memory-based decision making. Here, relevant brain structures that mediate the retrieval of attributes related to the decision options have been identified in the hippocampus and ventral striatum, as well as in a fronto-parietal control network mainly consisting of the lateral prefrontal and posterior parietal cortex. Furthermore, the studies by Helversen and Fechner show that decision strategies can be successfully dissociated with neural measures, improving classifications based on behavioral data alone. Finally, the studies by Horr and Peters show that the orbitofrontal cortex contributes to intuitive decision making and that prospection abilities (i.e., projecting oneself into the future) can impact decision processes, with such interactions involving brain regions implicated in episodic memory.

## **SYMPOSIUM: Numerical Cognition**

André Knops

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The ability to perceive, comprehend and manipulate numerical information plays a pivotal role in today's society. Despite its relevance the underlying cognitive and neural mechanisms remain elusive. The diversity of approaches for investigating these issues has often resulted in subsuming numerical cognition under 'generic umbrellas' such as 'reasoning', 'vision' or 'memory', precluding in-depth discussion. The proposed symposium is seeking to provide a common platform where these questions can be bundled and coherently discussed. The symposium will comprise contributions that tackle the principles of perceiving and manipulating numerical information at different scales. These include the investigation of basic behavioral and neural principles of conscious and unconscious single number perception (Cavdaroglu, Hesselmann, Valsecchi, Vogel), and the role of motor codes in number priming (Sixtus). To better understand the formation of arithmetic knowledge one contribution will discuss the effects of non-invasive brain stimulation on the acquisition of arithmetic knowledge (Grabner). Once acquired, arithmetic knowledge comprises conceptual, procedural and semantic aspects. Two contributions will address the question how adequate arithmetic strategies can spontaneously be recognized (Godau) and what role fluid intelligence plays in strategy use (Dix). The neural connectivity of simple and complex mental arithmetic will be addressed (Katz). Further contributions come from Heim/McMillan/Grossman, Schroeder/Nuerk/Plewnia, and Weis/Estner/vanLeeuwen/Lachmann.

## **SYMPOSIUM: Vestibular Cognition: Affect, Space and Body Representation**

Fred W. Mast

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A growing number of studies report the involvement of vestibular information in tasks that are – at first glance – remote from its classical functions like gaze control and upright stance. A case in point is the high comorbidity between vestibular disorders and psychiatric symptoms, showing the existence of vestibulo-affective connections. This becomes evident in Acrophobia that leads to impaired exploration and balance (Thomas Brandt, München), and in altered vestibular thresholds during simultaneous processing of emotional information (Nora Preuss, Bern). Vestibular information contributes to spatial aspects of bodily self-consciousness and multisensory integration (Christian Pfeiffer, Lausanne). We rely on an internal model of gravity for motor actions, perceptual estimations and imagined spatial transformations. Heiko Hecht (Mainz) has investigated whether dynamic motion extrapolation is based on body- or gravitational reference frames. This symposium shows the three major emerging areas of vestibular cognition, and an integrative view including modeling will be presented (Fred Mast, Bern). Vestibular information has widespread cortical projection areas, and in combination with behavioral research we will better explore the functions and networks. The field of embodied cognition will benefit from a more profound understanding of vestibular involvement in the processing of emotions, spatial transformations and the representation of the body.

## **SYMPOSIUM: R: Statistics at your command**

Meik Michalke

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R is a free software package (and programming language) for statistical analyses and graphics. Over the past years, the acceptance of R has grown noticeably in the field of psychology: Insitutes consider its use as a cost-free replacement for SPSS, some have already accomplished this, and the number of releases of specialised psychology-related R packages is increasing. This symposium shall help provide visibility to the trend. Its contributions are addressed to both, interested novices and R professionals: From graphical user interfaces, which help teaching statistics, to tools, which assist your writing of articles or R packages, to concrete implementations of statistical methods you vainly look for in other statistical software. The symposium emerged on the initiative of of the German-speaking "psych-useRs" mailing list, which is open to all psychologists with an interest in R: <https://wwwmail.uni-duesseldorf.de/mailman-lists/listinfo/psych-users>

## **SYMPOSIUM: Breaking the rules:**

### **Cognitive mechanisms and behavioral signatures of non-conformity**

Roland Pfister<sup>1</sup>, Robert Wirth<sup>1</sup>, Aiste Jusyte<sup>2</sup>

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Social norms and rules are a cornerstone of human societies and ensure order and functioning. Yet, not all rules can be obeyed at all times, and the corresponding non-conformity comprises a large behavioral repertoire, including such behaviors as stealing, cheating, rule-breaking, lying, and deceiving. Research across different fields has devoted continued effort to uncover the predictors that render non-conformity more or less likely; by contrast, however, the cognitive representations and mechanisms guiding these different forms of non-conformity are only barely understood. The proposed symposium aims at gathering experimental psychologists from different communities at one table – with work on rule-breaking in healthy individuals as well as convicted criminals, unethical behavior in economic bargaining situations, as well as research on lying and lie-detection. The submitted talks thus provide a remarkable coverage of recent progress towards understanding the representations and mechanisms underlying different faces of non-conformity and the interrelations of converging lines of research.

### **SYMPOSIUM: Prioritization in Dual-Task Control**

Aleksandra Pieczykolan<sup>1</sup>, Tilo Strobach<sup>2</sup>

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Dual-task research is characterized by investigating dual-task costs resulting from the execution of two concurrent tasks. Classical dual-task models, e.g. structural bottleneck or content-based interference accounts, usually explain these costs with rather rigid, inflexible processing mechanisms. However, more recent accounts place more emphasis on the notion of flexible and/or strategically adjustable processes. The present symposium brings together researchers, who study dual-task control under the aspect of flexible resource adjustments. Using a variety of experimental paradigms, they focus on such adjustments during the processing of two component tasks with different priorities or with improved task control as a result of practice. Specifically, the talks will address the limits of introspection about one's own dual-task costs in the PRP paradigm (Bratzke & Bryce) and how the combination of response modalities influences processing priorities (Pieczykolan & Huestegge). Furthermore, it is discussed how task prioritization is induced by explicit instruction (Steinborn & Huestegge) and how task order is modulated by task control processes such as inhibition (Cichecki, Nolden, & Koch). Finally, the effects of dual-task training on the efficiency of task control are presented (Strobach & Schubert).

### **SYMPOSIUM: Spatial cognition – Wayfinding**

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In everyday life we need to find our way with the help of our innate navigation system: the (spatial) cognitive system. Therefore, it is important to understand the perceptual, cognitive, and neural processes underlying spatial abilities. Here, we want to focus on human wayfinding. In this symposium we will bring together interdisciplinary experimental research from various fields, such as wayfinding, spatial learning, mental mapping, ageing effects on route memory, and language in mental representation of space.

## **SYMPOSIUM: Prospective Memory – Current Trends and Theoretical Advances**

Philipp Schaper, Tobias Grundgeiger  
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Prospective memory (PM) refers to the memory of tasks which are to be executed in the future. Because PM failures account for more than 50% of all everyday memory problems (Crovitz & Daniel, 1984) factors affecting PM performance are of major interest. Research on PM was nearly nonexistent until 1990 but has now caught and kept interest of researchers worldwide resulting in a steadily rising number of publications (Einstein, 2014). The field has also diversified, encompassing several different established paradigms and areas of interest. This diversity is also represented in this symposium. While Walter and Meier present a study on PM performance differences due to absolute and relative importance instructions, Rummel et al. investigate the influence of the necessary interruption of the ongoing task to execute the delayed intention. Furthermore the time of day as indicator for on-peak and off-peak performance in PM tasks will be presented (Rothen & Meier). After completion of PM tasks the intentions should be deactivated, yet they can resurface and cause commission errors and interference on ongoing task performance. Schaper and Grundgeiger present research on commission errors using the delayed execute paradigm, while Möschel et al. present a set of studies on task interference of former intentions and their decay over repeated exposure rather than over time.

## **SYMPOSIUM: Neural bases of predictive processing in speech and language**

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When we listen to speech or read, our brains constantly process and monitor the available sensory information and benefit from predictive mechanisms allowing a specific language context to generate expectations about upcoming information (words, speech sounds etc.). The aim of this symposium is to bring together researchers with a genuine interest in how predictive mechanisms support the processing of spoken and written language in normal and adverse listening situations. The contributors of this symposium approach the topic from various angles, employ state-of-the-art neuro-scientific methodologies, and try to further the understanding of how predictive mechanisms contribute to speech and language processing and which neural bases they draw on. In this respect, Ediz Sohoglu highlights the importance of fronto-temporal regions for perceiving and learning of degraded speech, while Corinna Bonhage employs a multi-modal experimental design to examine the neural bases of predictive mechanisms in reading. Johanna Rimmele and Mathias Scharinger bring together neural oscillatory dynamics and predictive processing with respect to speaker identification and speech sound categorization. Gesa Hartwigsen examines how the temporary disruption of language-related brain areas affects predictive processing, and Alessandro Tavano dissects top-down predictions from bottom-up predictions error propagation during speech perception.

**SYMPOSIUM: What you ever wanted to know about eye-tracking but were afraid to ask**  
Michael Schulte-Mecklenbeck<sup>1</sup>, Susann Fiedler<sup>1</sup>, Frank Renkewitz<sup>2</sup>, Jacob Orquin<sup>3</sup>, Felix  
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In the last five years the number of studies in the field of judgment and decision making which employ eye tracking methodologies has almost doubled. However, in spite of this explosion of interest in the role of directed attention in the preference construction process most studies are limited to choices between two options; routinely risky prospects or common goods. Furthermore, such studies in general use very rudimentary analysis techniques, failing to take advantage of the tremendous amount and quality of data generated. This symposium will focus on ways in which both the data generated using eye tracking methodologies and the methodologies themselves can be advanced to expand our knowledge of directed attention's role in information acquisition, cognitive processes, judgment, and choice. Specifically, this symposium will include talks in which the link between attention and choice (Orquin) as well as preference construction (Henninger) is reviewed; the role of memory processes and their innovative study (Renkewitz) as well as the inference from observed fixation data to cognitive processes (Schulte-Mecklenbeck) will be discussed. Finally, an analysis and suggestion on how to report eye-tracking studies in a transparent manner (Fiedler) will open a broad discussion of these timely issues. This symposium provides an overview of the current affairs of eye tracking methodologies with succinct suggestions in which such methodologies can be improved.

**SYMPOSIUM: How do we solve demanding situations – a discussion on driver skills and abilities**

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During the past decades automobiles have grown to become one of the indispensable means of transportation in our daily life. Our today's driving situations are characterized by high levels of traffic, the presence of additional information through information- or assistance systems as well as the availability of mobile devices. All of this makes driving a car a challenging and multidimensional task. This is why we have an important and significant body of research already available dealing with the negative correlation between driver distraction and the risk of driving failures. However, while drivers commonly perform other activities besides the sheer driving task severe traffic accidents are scarcely the consequence. It is to be assumed that there is a whole range of skills and abilities that normally enable drivers to solve even the most demanding driving situations successfully. The present symposium is to approach and discuss these skills and abilities in the dynamic interplay of driver and driving situation by inviting talks from both basic as well as applied research.

### **SYMPOSIUM: Attention and time in perception and action**

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To successfully live within a rapidly changing environment, humans not only focus on currently relevant information, but also use of their ability to estimate time in order to attend to upcoming stimuli and prepare for future actions. On the one hand, for instance, the conductor of an orchestra must be able to dynamically deploy his attention within time and adjust his movements accordingly so that the orchestra members match the beat of the music. On the other hand, physical stimulus properties of the environment and current cognitive states modulate attentional deployment over time and influence time perception and estimation. For instance, time seems to fly when being engaged in a stimulating task but creeps when waiting at the bus stop in rainy weather. Not surprisingly, the investigation of both attention and time are central topics in Cognitive Psychology. The symposium combines behavioural, psychophysical, and modeling accounts to examine temporal aspects of information processing. Specifically, we present six studies focusing on how temporal attention influences perception or action, how it interacts with specific modes of attention (e.g., modality-specific attention), and how cognitive states (e.g., mood, arousal) modulate temporal attention and alter time perception.

### **SYMPOSIUM: How and What Am I Doing? New Findings on Metacognitive Monitoring and Control**

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Research on metacognition examines people's knowledge and assessment of their own cognitions (monitoring component) as well as their strategic approach to cognitive tasks (control component; cf. Nelson & Narens, 1990). In this symposium, new research on both components from a wide array of cognitive-experimental paradigms will be presented. Regarding metacognitive monitoring, the identification of specific influences on memory predictions is of great interest to the field. In the first talk, Eftychia Volz-Sidiropoulou will present evidence that item retrievability – but not item recognition – influences item memory predictions (delayed Judgments of Learning [JOLs]). Then, Monika Undorf will provide conclusive evidence that the experience of perceptual fluency, caused by an item's physical size, influences JOLs. The following talks will address the interplay of monitoring and control. In the third talk, Beatrice Kuhlmann will demonstrate the influence of presentation volume on predictions of source memory (Judgments of Source [JOS]) and on source-monitoring performance through metacognitively controlled guessing. In the fourth talk, Elisabeth Pieger will discuss the role of (dis)fluency for metacognitive monitoring and control in the domain of text processing. Finally, Barbara Drücke will explore metacognition in the domain of attention (Stroop task) and draw comparisons to findings from the memory domain.

**SYMPOSIUM: Automatic processing of emotional stimuli:  
Evidence from new variants of priming tasks**

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An enduring topic of the cognition-&-emotion field is the fast, effortless, unintentional, potentially unconscious (viz. "automatic") extraction of evaluative features from emotional stimuli, which is typically explored with the priming paradigm. During recent years, several new questions came to the foreground. Four talks are considered with the question whether more than valence is automatically extracted from emotional stimuli. Kozlik and Neumann examined whether there is evidence for an authenticity check, i.e., whether authentic emotional expressions can be differentiated from simulated ones. Rohr and colleagues report about experiments with masked pictures of emotional scenes and explore the differentiation of automatic evaluation. Neumann presents data that show that the second dominant of Osgood's dimensions, i.e., potency, is automatically extracted. Burghardt explored whether automatic valence processing is mediated by semantic meaning. Two further talks deal with the processes of automatic evaluation. Recently, de Paula Couto and Wentura introduced a new variant of the evaluative priming paradigm, that is, a go/no-go version. In the talk they provide evidence that this version is based on different processes than the standard task. Recent evidence suggests a close link of priming and working memory research. Scherer and Wentura present first evidence on this issue.

**SYMPOSIUM: Intuition and insight:  
Two fundamentally different non-conscious (solution) processes?**

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It seems as if there is consensus that intuition precedes insights and therewith fuels insight-based problem solving. Yet, research on intuition and insight developed mostly independently using different paradigms and referred to one another only marginally. It is now about to tackle this issue. The symposium will therefore focus on the relationship between intuition and insight. While intuition has been defined as a non-conscious, experience-based and gradual process resulting in a strong tendency towards a hunch or a hypothesis, insight processes have been characterized by a representational change of the problems' elements resulting in a sudden insight into the solution (accompanied by an "aha!"-experience). Thus, both instances may be conceived of as a special type of problem solving, namely when approaching an idea occurs by sensing and solutions cannot be found through analytical processing. Both processes, however, may be discerned according to their underlying mechanisms. It is suggested, that they differ to the extent that solutions can be consciously verbalized, regarding their gradual versus discontinuous unfolding, and whether and how feelings are involved (feeling of warmth versus "aha!"-experience). Based on this suggestion, the symposium aims to disentangle similarities and differences of intuition and insight from different perspectives.



# Talks and posters

## **Can actor gaze modulate the recent event preference during spoken sentence comprehension?**

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Visual-world eye-tracking studies show rapid visual-context effects on spoken comprehension. Participants prefer to inspect the target of a recently depicted event over the target of a future event when they listen to a related sentence (NP1-VERB-ADV-NP2), and this holds even when most sentences refer to the future events. In two eye-tracking studies (each N=32) we tested to what extent the recent-event preference is modulated by a situational cue such as gaze, which rapidly directs visual attention. An Actor performed one recent action before and one future action after the sentence. The sentences about these events were equally often in the future and past tense. In half of the trials, the actor gazed at the target object (Experiment 1: 380 ms after verb onset; Experiment 2: at verb onset). Results: Gaze modulated the recent-event preference earlier during the verb region than in previous studies, and more in the future condition than in the past, thus mitigating the preference. However the preference for the recent target replicated throughout the sentence irrespective of gaze and tense. We propose that what underlies the recent event preference is an epistemic preference for assertions about past events (McFarlane 2003; see Staub & Clifton, 2001).

### **Affective responses to emotion words are boosted in communicative situations**

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Emotional verbal messages are typically encountered in meaningful contexts, for instance, during face-to-face communication in social situations. Yet, they are often investigated by confronting single participants with isolated words on a computer screen, thus potentially lacking ecological validity. In the present study we recorded event-related brain potentials (ERPs) during emotion word processing in communicative situations provided by videos of a speaker, assuming that emotion effects should be augmented by the presence of a speaker addressing the listener. Indeed, compared to non-communicative situations or isolated word processing, emotion effects were more pronounced, started earlier and lasted longer in communicative situations. Furthermore, while the brain responded most strongly to negative words when presented in isolation, the same words yielded a positivity bias with more pronounced emotion effects for positive words in communicative situations. These findings demonstrate that communicative situations – in which verbal emotions are typically encountered – strongly enhance emotion effects, underlining the importance of social and meaningful contexts in emotion processing.

### **Practice with Bandwidth-Feedback Facilitates Automatization in Motor-Learning**

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For most motor skills, the level to which the movement is controlled automatically is crucial (James, 1890). Feedback is of particular interest, when it comes to motor learning (Marschall et al., 2003), but the influence of informative content, frequency and timing of feedback on automatization is widely unknown. Based on the assumptions that positive feedback has crucial effects on motor learning (Schultz, 2002) and that errors during motor learning provoke explicit hypothesis testing and therefore explicit learning (Masters & Maxwell, 2004), it is believed that positive feedback as well as the reduction of error-feedback facilitates automatization of motor skills. In the present study the influence of bandwidth-feedback (qualitative positive feedback within a certain bandwidth of performance and quantitative error-feedback outside of this bandwidth) on the automatization (dual-task cost reductions) of an arm-movement-sequence was examined. The results indicate that the bandwidth-feedback leads to a greater increase of automatic control compared to a group with 100% feedback frequency. The comparison of the bandwidth-group to a yoked-control group (same error-feedback frequency without positive qualitative feedback) shows group differences by tendency. These tendencies indicate that the feedback of positive results as well as a reduction of feedback frequency has a positive influence on automatization.

## **Embodiment im Zweitspracherwerb: Erfahrungsspuren bei der Verarbeitung von Präpositionen**

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Ein neueres Konstrukt der Sprachverarbeitung ist die sogenannte verkörperte Kognition, oder auch Embodiment, in dem Motorik und Wahrnehmung eng mit der Sprachverarbeitung verknüpft sind (Barsalou, 1999). Innerhalb dieses Ansatzes existiert die spezifische Theorie der Erfahrungsspuren, oder auch *Experiential-Traces-Theory* genannt (Zwaan & Madden, 2005), nach der Sprachverarbeitung auf der Reaktivierung von Erfahrungsspuren basiert, die durch Erfahrungen mit den korrespondierenden Objekten, Zuständen oder Ereignissen gebildet wurden. Während diese Theorie im Erstspracherwerb viel Anklang und Bestätigung erfahren hat (Jirak, Menz, Buccino, Borghi & Binkofski, 2010; Glenberg, A. M., Goldberg, A., Zhu, X., 2011) bleibt unklar inwiefern sie auf den Zweitspracherwerb zu übertragen ist. In dieser Studie soll mit Hilfe einer Adaptation des Stroop-Paradigmas (siehe Lachmair, et al. 2011) der Einfluss der körperlichen Erfahrungen auf den Zweitspracherwerb von räumlichen Präpositionen untersucht werden. Hierzu sollen verschiedene Werkrealschüler der Klassen 5–9 mit unterschiedlichen Sprachhintergründen untersucht werden. Zusätzlich werden auch noch weitere Einflussfaktoren wie das Erwerbsalter, Migrationshintergrund und die allgemeine Sprachkompetenz in die Untersuchung einbezogen. Durch diese Studie erhoffen wir uns erweiterte Kenntnisse darüber, inwiefern es sinnvoll ist die Bildung von Erfahrungsspuren im Zweitspracherwerb aktiv durch entsprechende Trainings zu unterstützen.

## **Social Influence on Perceptual Decision-Making: Integrating Evidence from Event-related Potentials and a Diffusion Model Analysis**

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Recent research in social neuroscience provides first evidence that social influence can alter early visual processing (e.g., P1; Trautmann-Lengsfeld & Herrmann, 2013). However, it remains unclear how these early effects can contribute to changes on the behavioral level (i.e., responding conform vs. non-conform). Following a diffusion model approach, Germar, Schlemmer, Krug, Voss and Mojzisch (2014) disentangled the cognitive processes underlying the speeded binary decisions in a perceptual-decision making task. In accordance with the findings from social neuroscience, they revealed that social influence can alter the uptake of sensory information. However, since a diffusion model analysis is based on behavioral parameters (i.e., response time distributions), the neural processes underlying the effect found are still to be uncovered. In the present study we used event-related potentials and a diffusion model analysis to bring together the two lines of research. We found that social influence can alter early visual processing (P1, N1), but that these effects were not related to changes in the parameters of the diffusion model. Additionally, we explored the correlations between diffusion model parameters and later ERP components (P3, LRP). We will discuss the relations between ERPs and diffusion model parameters and their implication for further research on social influence.

## The influence of practice on individual differences in metacontrast masking

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CANCELED

In metacontrast masking the visibility of a briefly presented target stimulus is reduced by a subsequent masking stimulus whose contours fit snugly around those of the target stimulus. Depending on stimulation parameters discrimination performance either increases (type-A) or decreases (type-B) with stimulus onset asynchrony (SOA) between target and mask. But even under identical stimulation conditions, some participants exhibit type-A masking and some exhibit type-B masking. Although these differences are enhanced over the course of an experiment by perceptual learning, it is still unclear if they result from initial differences in stable dispositions or if situational variables determine which masking type is learned. We present studies investigate (1) how individual masking functions evolve with longer practice and (2) if participants can be forced to develop one or the other type of masking function by training with particular SOAs. Results show that practice over five sessions left the masking type unchanged. Rather, individual masking functions even got more pronounced. Moreover, training with only one short or one long SOA did not affect the resulting type of individual masking functions. Thus, individual masking functions seem to be determined more by preferences or dispositions than by practice in the particular task.

## N400 modulations underlying repeated prime presentation in associative priming paradigm

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In the current study we used event-related potentials (ERPs) to examine special features of prime processing in associatively related or unrelated prime-target word pairs (associative priming paradigm). It is assumed that preceded prime presentation leads to improvement of related target processing efficiency if compared to unrelated target. We made an assumption that not only preceded prime presentation effects target processing, but also target presentation initiates rearrangement of prime representation. This assumption was confirmed by experiment results: repeated presentation of primes from non-associated word pairs, which were presented a day earlier, is accompanied by increase of ERPs positivity in 350–550 ms temporal window (N400 ERP component) as compared to primes from associated word pairs (differences are statistically reliable in C3, Cz, C4 locations). Decrease of N400 amplitudes is connected with improvement of stimuli processing efficiency in identification tasks (Gotts et al., 2012). We consider obtained results as a confirmation for the idea of proactive brain, which continuously generates predictions concerning subsequent stimulation (Friston, 2003; Bar, 2009). Priming can be regarded as a prediction error minimization caused by “obtruding” a definite prediction via prime presentation. Mismatch of such prediction and sensory input causes rearrangement of prime representation.

## **Crossmodal odor–taste congruence – matching, liking & knowing**

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During food ingestion both, olfactory and gustatory percepts are elicited and bimodal memories formed. Prior experiences allow us to assess the congruence of odor–taste combinations, i.e. how well they correspond. Whether the distinct sensory events are perceived as one coherent entity likely shapes the hedonic experience and subsequent food choice. The effects of congruence on the perceptual experience of odor–taste combinations are still unknown and were investigated in the present study. We hypothesized that the degree of odor–taste congruence influences multisensory integration processes and thereby aspects of the perceptual experience. To test this hypothesis, we presented odor–taste pairs of varying degrees of congruence, spanning from fully congruent to fully incongruent. Participants rated stimulus intensity, pleasantness, familiarity and congruence using visual analog scales. To assess the degree of odor–taste integration we measured response times to the bimodal pairs and their unimodal constituents. Familiarity and pleasantness ratings changed as a function of perceived odor–taste congruence. Stimulus intensity, in contrast, was strongest for congruent and incongruent and dampened for ambiguous odor–taste pairs. Response time data suggest that odors and tastes were indeed integrated. These results suggest that cross–modal odor–taste percepts are modulated by learned associations and perceived congruence between the sensory inputs.

## **Inter–Trial Contingencies of Cueing Effects**

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We tested for variations of attentional and response–activation effects following experienced conflict between attention shifts and response activations (so–called ‘Gratton effects’). We found that congruence effects based on response activations were stronger following congruent than incongruent trials. An analogous pattern was replicated for attentional validity effects that were stronger after validly than invalidly cueing the target. However, conflict in preceding incongruent trials had no influence on the validity effect in subsequent trials, and conflict in preceding invalid trials did not diminish the congruence effect in a following trial. This was found with a dual–task (Experiment 1) and a single–task procedure (Experiment 2). Results suggest that attention plays no role in Gratton effects based on response activations.

## The Generalized Context Model provides a single-process account of two-dimensional false recognition data

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Research on false recognition of items and events, often accompanied by strong subjective feelings of confidence, has informed the study of the structure and processes of episodic memory (Gallo, 2006). Double dissociations between true and false recognition (e.g., Stahl & Klauer, 2008) have been difficult to account for by single-process models of memory and have been invoked as argument for the existence of two separable mnemonic processes (e.g., Brainerd & Reyna, 2005). In two false recognition experiments, we varied target repetitions and the number of lures in study lists and demonstrate the two-dimensionality of old-new responses through state-trace analysis. We then fit the Generalized Context Model (GCM, Nosofsky, 1989)—a member of the larger class of single-process global matching models that predict performance based on inter-item similarities (e.g., REM, Shiffrin & Steyvers, 1997)—to these data. The model was able to reproduce the two-dimensional pattern of old-new responses. GCM and global matching models, thus, provide a single-process account of false recognition: mnemonic activation of targets and lures differs as a function of inter-item similarities. We discuss criterion shifts as alternative explanation and the implications of our findings for dual-process accounts of false memory.

## TreeBUGS: A Tool for Hierarchical MPT Modeling using BUGS

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Multinomial processing tree (MPT) models are a class of models that can be applied to categorical data to determine underlying cognitive processes. Traditionally, MPT models are applied to aggregated data thereby ignoring heterogeneity in participants and items. This can lead to biased parameter estimates. Recently, hierarchical extensions have been proposed to incorporate heterogeneity and yield individual parameter estimates. This makes them applicable to even more research questions. Programs like WinBUGS (Spiegelhalter, Thomas, Best, & Lunn, 2003) can estimate hierarchical models by using Markov chain Monte Carlo methods. There exist WinBUGS implementations for the beta-MPT approach (Smith & Batchelder, 2010) and the latent-trait approach (Matzke, Dolan, Batchelder, & Wagenmakers, 2013) for the pair-clustering MPT model that can be adapted to other models but still require a certain amount of programming knowledge. TreeBUGS is an R package that can translate commonly used model files (eqn-files) into WinBUGS code for beta-MPT modeling and calls WinBUGS with only little additional information needed. It provides estimates of the individual and group parameters and their variability. Extensions for the latent-trait approach and other Gibbs samplers are planned.

## **The benefits of outcome variability on adaptation to change**

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Our decisions often involve repeated choices between options which contain several possible outcomes, and where possible outcomes can change over time, though such decisions are rarely investigated in the lab. Therefore, in the current studies we examined the impact of payoff variability on adaptation to changes in a non-stationary-decisions-from-experience paradigm (cf. Rakow & Miler, 2009). In Study 1 participants made repeated choices between low or high-payoff variability options and received immediate outcome feedback. After 50 choices one option's value changed such that it became (non-)dominant. We found that rates of maximization were higher before the change in the low-payoff variability option. However, the direction of change had a greater impact on the low-payoff variability option, with decreases in value being adapted to more readily than increases. Study 2 increased the number of choices made before the change occurred and found that increased experience reduced adaptation. Study 3 employed several levels of payoff-variability and found that low and no-payoff variability options led to greater rates of maximization before the change, while following the change low to moderate-payoff variability led to the greatest rates of adaptation. Thus it appears that payoff-variability acts as a double-edged sword, stymieing initial learning, while facilitating adaptation.

## **The two faces of selective memory retrieval: Earlier decline of the beneficial than the detrimental effect with older age**

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Depending on the degree to which the original study context is accessible, selective memory retrieval can both impair and improve recall of other memories. Here, we examined age-related differences in these two faces of memory retrieval. In Experiment 1, younger and older adults studied a list of target and nontarget items and, thereafter, received a cue to either forget or continue remembering the list. Later, memory for the target items was tested, either with or without preceding retrieval of the nontarget items. Whereas preceding nontarget retrieval impaired recall of (easy-to-access) to-be-remembered targets in both age groups, it improved recall of (hard-to-access) to-be-forgotten targets in younger, but not in older adults. Experiment 2 was similar to Experiment 1 except that we manipulated the accessibility of the study context by varying the delay (short vs. long) between study and test. Preceding nontarget retrieval impaired recall of (easy-to-access) targets in the short-delay condition, regardless of age; in contrast, it improved recall of (hard-to-access) targets in the long-delay condition in younger, but not in older adults. The results suggest an age-related dissociation between the two faces of memory retrieval, indicating earlier decline of the beneficial than the detrimental effect of selective retrieval.

## **Implicit and explicit attitudes toward the ex-partner after (ex-)partner schema activation**

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What individuals deliberately think about their ex-partner might not always be resembled by unconscious processes. Especially, when one is confronted with thoughts of the ex-partner (i.e., activates this mental representation) automatic and reflective processes might not converge. Two studies investigated implicit and explicit attitudes after the activation of the ex-partner schema vs. current partner schema (vs. control group). More specifically, participants had to answer different questions concerning their ex-partner (vs. their partner vs. a comic figure) before the attitude measurement. We expected implicit attitudes to be less affected by schema activation than explicit attitudes. In Study I, 90 women participated. Study II used the same methodology for 114 men and women to examine possible gender differences. Implicit attitudes were measured with a single category IAT, explicit attitudes with a questionnaire. The results confirmed the hypotheses for women. Men seem to have generally more positive attitudes toward their ex-partners. The found effects of the schema activations were additionally moderated by several variables as, for instance, anxious attachment representations. However, the importance of these variables differed for the two attitude measures. The results give new insights in conscious and unconscious processes individuals undergo after the separation from an intimate partner.

## **The Effects of Saturation on Web Site Trustworthiness, Appeal, and Perceived Usability**

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Previous research on the perception of web sites has shown that users' impressions of web sites generated in very short presentation durations (50 ms) correlate with their assessment after longer presentation durations. On the basis of the importance of saturation in the design of web sites, we present a 2x3 study design in which participants either assessed highly saturated or de-saturated versions (between-subjects) of 50 web sites coming from 10 content domains. All web sites were presented three times to each participant in varying durations (50 ms, 500 ms, and 10 s) and each site was rated regarding its trustworthiness, appeal, and perceived usability. Based on differences caused by the saturation manipulation, we propose a temporal model in which users first evaluate the appeal of a web site, followed by its usability, and lastly its trustworthiness. Our results have broad implications for the design and presentation of information using digital media.

## **papaja: Create publication-ready manuscripts in R**

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Recently, growing attention has been drawn to the large number of scientific findings that are not reproducible. One aspect of this worrisome state of affairs, which is not limited to the field of psychology, is non-reproducibility of statistical analyses and scientific computations. Given that raw data are available, the reproducibility of analyses should be considered a minimum standard for judging scientific claims (Peng, 2011). Two obvious reasons for non-reproducibility of analyses are incorrect and incomplete reporting of methods and statistics. A review of psychological journal articles found that 18% of the statistical results were reported incorrectly; these errors lead to incorrect inferences in 15% of surveyed articles (Bakker & Wicherts, 2011). Dynamic documents that merge reports and analysis scripts are an effective way to avoid erroneous statistical reporting (Gandrud, 2013). We introduce 'papaja', a package for the R Statistical Environment (R Core Team, 2014) that provides a framework to create dynamic documents that adhere to American Psychological Association (APA) guidelines (<https://github.com/crsh/papaja>). The papaja package is tailored to the needs of experimental psychologists: we supply convenience functions to report statistics in accordance with APA guidelines in a way that ensures reproducibility of analyses and facilitates future synthesis of results.

## **Flugzeuglärm und Leistungsveränderungen bei der Gepäckkontrolle am Flughafen**

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Mit den gestiegenen Sicherheitsanforderungen und der Zunahme an Flugbewegungen nehmen auch die Anforderungen an die Arbeitsplätze in der Luftverkehrsbranche zu. Dabei ist der Arbeitsplatz von Luftsicherheitsfachkräften in der Gepäckkontrolle durch Fluglärm und Fluggastgeräusche (insbesondere Sprache) besonders beeinträchtigt. Diese Umweltfaktoren der Arbeitsplätze wurden aber bislang noch nicht empirisch untersucht. Um die Bedeutung der Wirkung dieser Einflussgrößen auf die Leistung abschätzen zu können wurde ein Laborexperiment durchgeführt. 18 Luftsicherheitsfachkräfte absolvierten eine Gepäckkontrollaufgabe mit einem simulierten Röntgenscanner, in der sie verbotene Gegenstände aus Gepäckstücken auf Bildern erkennen sollten. In unterschiedlichen Durchgang wurden die äußeren Bedingungen durch eingespielten Fluglärm und Umgebungsgespräche variiert und die Auswirkung auf die Leistung in der Aufgabe gemessen. Als abhängige Maße wurde die Reaktions- bzw. Suchzeit bis zur Entscheidung, ob ein gefährdendes Objekt (nicht) vorlag, erfasst. Zudem wurden zentrale Maße der Signalentdeckungstheorie (Sensitivitätsmaße, Trefferraten, Falsche Alarmer) aus den Verhaltensdaten der Probanden berechnet. Die Ergebnisse zeigen, dass es bei Lärm zu einer signifikanten Leistungsverbesserung der Luftsicherheitsfachkräfte kam. Diese – zunächst paradoxen – Effekte können vor dem Hintergrund der Theorie der kompensatorischen Kontrolle (Robert & Hockey, 1997) interpretiert werden: Scheinbar wissen die Probanden über die Beeinträchtigung durch den Lärm und mobilisieren daraufhin verfügbare Ressourcen für die Erledigung der Aufgabe. Fraglich bleibt, wie lange die kompensatorischen Effekte wirken und wie belastend die Situation für die Versuchspersonen empfunden wird.

## **Einfach und doch sicher: Die Wirkung von Passwortrichtlinien auf Websites**

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Passwörter sind sehr beliebt, um den Zugang zu IT-Systemen gegenüber Unberechtigten zu schützen. Obwohl diese Authentifizierungsform überaus geläufig ist, klaffen das vermeintliche Wissen der Nutzer und die tatsächliche Passwort-Praxis weit auseinander. Die Verantwortung hierfür trägt nicht allein der Nutzer, auch Serviceanbieter sind in der Pflicht, Sicherheitskonzepte möglichst einfach umzusetzen. Um zu prüfen, ob dafür bereits einfache Maßnahmen wie die Bereitstellung von Passwortrichtlinien und eines Passwort-Meters auf Websites effektiv sind, wurden in einem Experiment (N = 41) zwei Versionen derselben Website getestet. In der Experimentalbedingung enthielt die Website ausformulierte Hinweise zur Gestaltung sicherer Passwörter mit Beispielen sowie ein interaktives Feedback zur Sicherheitsstufe des gewählten Passworts. In der Kontrollbedingung enthielt die Website lediglich den Hinweis, ein möglichst sicheres Passwort zu generieren. In keiner der beiden Bedingungen gab es eine systemseitig erzwungene Korrektur des Passwortes. Erfasst wurde neben der Passwortsicherheit die subjektiv vom Nutzer empfundene Einfachheit der Passwörterstellung. In der Experimentalbedingung generierten die Probanden Passwörter höherer Sicherheit. Gleichzeitig fiel ihnen die Erstellung eines guten Passworts leichter, wenn Passwortrichtlinien vorhanden waren. Daraus ergibt sich, dass Website-Provider allein durch das Anbieten derartiger Richtlinien die Sicherheit ihrer Nutzer unterstützen können.

## **The effect of canned laughter on film perception**

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Laughter is contagious and TV shows have made use of this by adding so-called canned laughter to their shows. Past research has explored under what conditions a laugh track makes material seem funnier. However, the theoretical foundations of why a laugh track might work have escaped scientific scrutiny in the past. We designed a series of experiments with a total of 110 subjects to test the two main competing theories against each other. The social proof theory explains the effect of a laugh track by the social proof consumers get from the people audible on the laugh track. The social facilitating theory, on the other hand, explains the effect with the social function of laughter to facilitate group building and bonding. We introduced a scream track in addition to the laugh track, which should mirror the function of canned laughter if social proof theory was right. We found that this was only the case when real people were present, but not for the pre-recorded audience reactions. We conclude that the social facilitating theory explains our data best for the laugh track, but social proof has an additive effect when a live audience is present.

## **Sequence Learning and the Process Dissociation Procedure: How estimates of implicit and explicit knowledge are biased in the absence of associative learning**

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Whether or not sequence learning can be implicit is still an open research question. Crucial to this question are results from studies using the process dissociation procedure as introduced by Jacoby (1991) and applied to sequence learning by Destrebecqz and Cleeremans (2001). However, investigations of the underlying assumptions of the process-dissociation approach suggest that the validity of results obtained from process-dissociation may be limited. The present study investigates the possibility that processes other than sequence knowledge (for instance, response tendencies) may yield result patterns suggesting the presence of implicit or explicit sequence knowledge. 190 undergraduate students were or were not exposed to a Serial Reaction Time Task with two types of pseudo-random materials. Afterwards, participants worked on a process dissociation task that used either free or cued generation. Results showed that pre-experimental response tendencies, non-associative learning of location frequencies, and the usage of cue locations introduced bias to PD estimates. These biases may lead to erroneous conclusions regarding the presence of implicit and explicit knowledge.

## **Job satisfaction, job security and organizational commitment at a temporary research project**

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In a big research project the time frame for its funding is limited. It now has about 300 employees, but all funded jobs will end on or before 2015. While most employees currently working for the big research project are aware of the project's termination in 2015, they may still have a feeling of uncertainty about their future. Such uncertainty can arise from hopes by some that some other funding may be found to continue projects initiated and formerly financed in the research project. The detection of how variation across employees about their situation of job insecurity and organizational commitment influences job satisfaction is decisive by using the method of regression analysis. By repeating the on-line questionnaire it will be possible to discover intrapersonal changes and changes between groups while the end of the jobs is coming closer. For example in the first data collection of 90 employees the younger employees (from age of 19–29 years) are significantly more satisfied with their work than the employees at the age of thirty or older. Results of the two rounds of data collection are presented.

## Emotional responses are unaffected by the uncertainty of rumour and gossip

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Affective information about a person's social behaviour affects social interactions and exerts an influence on how we judge a person and perceive his or her face (e.g. Bliss–Moreau et al., 2008; Suess et al., 2014). However, the reliability of person–related information can vary considerably. In the present ERP study, we investigated influences of the certainty of affective person–related information on emotional responses. Participants learned about negative or neutral social behaviours of previously unknown persons. The reliability of this information was verbally marked as either factual information or uncertain rumour or assumption (by adding e.g. “it is said that...”). After learning this information, participants performed a perceptual old/ new recognition task and judged the person's valence based on the presented information (negative vs. neutral). Participants were clearly able to process the information about reliability as indicated by an additional rating and modulations of an early frontal negativity (N2). Nevertheless, emotional responses to the faces did not differ between certain and uncertain conditions, as indicated by an early posterior negativity (EPN) in the recognition task and a late positive potential (LPP) in the valence task, as well as behavioural results. Thus, emotional responses are strikingly unaffected by the certainty of affective information.

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## Roving vs. Constant Standards in the 2AFC Task: Trial–by–Trial Updating of the Internal Standard in Duration Discrimination

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In the 2AFC task, participants have to discriminate between a constant standard stimulus *s* and a variable comparison stimulus *c*. Employing this task, it has been repeatedly shown that perceived magnitude as well as discrimination sensitivity depend on the temporal order of *s* and *c*. To avoid such undesired and potentially biasing stimulus order effects, sometimes two or more different standard stimuli are randomly intermixed within a block of trials. We show that in such a roving standard task, stimulus order effects on discrimination sensitivity are just as strong as in the traditional task with constant standard stimulus. Moreover, estimates of perceived magnitude in the roving standard design are subject to even stronger bias than in the constant standard design. Thus, the roving standard design seems not especially suited to overcome potential effects of stimulus order. Moreover, the present results provide evidence for the formation of an internal reference, which is updated from trial to trial and serves as a basis for stimulus discrimination. This dynamic mechanism, formalized in the Internal Reference Model, closely predicts the observed pattern of results – unlike common psychophysical difference models.

## **Associated Valence Modulates Early Event-Related Potentials during Reading**

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Emotion effects in event-related potentials (ERPs) have often been explained with the heightened motivational relevance of emotional stimuli. In the case of written language processing, recent studies also suggested a possible role of associative learning in the emergence of emotion effects, especially in early time windows. The present study addressed this question by employing an associative learning paradigm. In a learning session, pseudowords were associated with positive, neutral or negative valence by means of monetary gratification and punishment. Importantly, half of the pseudowords were learned in the visual modality, while the other half was presented acoustically. In the test session one day later, pseudowords were again presented in both modalities in an old/new decision task while event-related potentials were recorded. Behavioral data show that positively and negatively associated pseudowords were learned faster than neutral pseudowords; furthermore, they received faster reaction times in the testing session. Interestingly, early emotion effects in ERPs were limited to visually learned pseudowords, indicating the importance of visual percept in the acquisition of valence during associative learning. Taken together, the results strongly suggest associative learning as a possible source of emotion effects in visual language processing.

## **Real-time assessment of demanding driving scenarios**

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Car drivers are usually aware of their own limited cognitive resources and shift their full attention on the primary driving task in demanding driving situations. Driver assistance systems should take into account the current demands in order to suppress unnecessary and maybe distracting information and provide situation-specific assistance. In a driving simulator experiment at TU Chemnitz, demands of various driving manoeuvres and situations were assessed by continuously measuring the frequency of secondary task engagement during driving. A total of 51 participants drove a 56-km track of highway, three times, and within a period of 6 weeks. During each drive, participants continuously completed a visual secondary task, the Surrogate Reference Task. Results showed that overall secondary task engagement increased with driving experience from session to session. However, declines in secondary task activity were observed for specific manoeuvres and situations: Lane changes resulted as demanding manoeuvres, where driver consistently shifted their attention on the primary driving task. In addition, changing driving conditions such as the beginning of construction zones, cue situations and changing weather conditions led to reduced secondary task engagement. Due to the high demands of lane change manoeuvres, algorithms for detecting lane change intentions are currently developed at TU Chemnitz in the framework of the German research initiative UR:BAN (urban-online.org).

### **Rotation: Preferred own and perceived motion and their relation**

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What is the nature of the relationship between action and perception, and are they commonly represented? These have been questions of central importance in psychology, since at least the formulation of the idea of event coding (e.g., Hommel, Müsseler, Aschersleben, & Prinz, 2001), and are particularly relevant to an embodiment perspective (Blake & Shiffrar, 2006). In this context, the relation of preferred own motion and reaction preferences to perceived motions can be questioned. Accordingly, we tested the relationship between rotation preferences, as measured by the preferential rotation on a swivel chair as well as the perceptual preference of the spinning dancer illusion's rotational direction, and several cognitive parameters (Stochl & Croudace, 2012). In a cognitive task, we measured participants' response times to classify the color of geometric objects moving in clockwise or counterclockwise circular course on a computer screen. Participants reacted significantly faster in trials in which the object rotated in the same (compared to the opposite) direction as their perceptual preference for the dancer. However, reaction times did not differ between trials that were congruent or incongruent with participants' swivel chair rotation preference. Preference for a rotational direction seems not globally related to other preferences or perception/reaction advantages.

### **Survival processing: The mnemonic consequences of thinking about function**

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Consistent with an evolutionary account of memory, imagining being stranded in the grasslands, and rating words for their survival value in that context, reliably leads to exceptionally good recall. The proximate mechanisms of this recall advantage, however, are still at debate. Two competing classes of theories of the survival processing effect can be distinguished. According to the first account, being passively exposed to threat, negative arousal, or the concept of death before encoding automatically produces mnemonic benefits. According to the second account, the survival processing advantage is caused by active, elaborate processing of the stimulus material that may be functionally motivated. In the present study, the survival processing scenario was framed in a negative or positive way, emphasizing either potential gains (health, shelter) or losses (disease, homelessness). Furthermore, participants were required to focus on the potential utility, or on the risks to survival when rating the words. Framing of the scenario had no effect on recall, but rating the utility of items for survival led to better recall than rating the risks associated with these items. The latter effect was replicated in a second experiment. Thinking about the utility of items was even more beneficial for recall than the standard relevance rating instructions. The results are inconsistent with theories sharing the assumption that the memory advantage is an automatic consequence of the passive experience of threat, negative arousal, or mortality salience before encoding, and strengthen theories that emphasize the role of active problem solving and creative thinking at encoding.

## **Effects of L1 transfer and semantic expectancy on second language processing of grammatical gender in Dutch**

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It is unclear whether and under what conditions late learners of a second language can adopt native-like processing strategies. Here, we investigate whether the presence of grammatical gender in the first language affects the electrophysiological signatures of second language processing. Event-related potentials were recorded while late L2 learners with or without grammatical gender in the first language listened to high and low-cloze Dutch sentences that included article-noun gender agreement violations. In the native speakers, we find a robust P600 for gender agreement violations and an N400 for low-cloze nouns. A larger N400 following the articles in low-cloze items shows that the native speakers predicted the gender of the article. In the learner groups, we see that – independent of L1 grammatical gender – violations in high-cloze (but not low-cloze) NPs result in a native-like P600. Moreover, there is a delayed and reduced N400 for low versus high cloze nouns, but not for the articles. Thus, while both groups of learners can show native-like processing of gender violations, neither group engages in gender prediction. The results support the idea that the morpho-syntactic features of the L1 do not constrain the acquisition of those of the L2.

## **Automatic activation of a referent's typical color during semantic categorization**

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According to grounded models of language comprehension (Barsalou, 1999) meaning is mentally represented in a multimodal fashion. Words are assumed to activate multi-modal experiences that were made when interacting with their referents, including moods, specific motor patterns, and sensory impressions. Here we report a Stroop like experiment that aimed at investigating whether the typical color of a word's referent gets activated when the word is being processed during semantic categorization. In each experimental trial, participants saw a noun on a smart board that referred to an object whose typical color was either yellow or green (e.g., "cucumber" vs. "banana", respectively). Participants decided whether the noun referred to something edible or not. Thus, importantly, the semantic categorization task did not focus on the color dimension. Responses were made by pressing a "yes" or "no" button on the smart board, one of which was green while the other was yellow. Results were in line with the idea of a multimodal representation of word meaning: Participants' responses were faster in congruent conditions (in which the color of the correct button matched the typical color of the noun's referent) than they were in incongruent conditions (in which the two colors did not match).

## **Individual differences in metacontrast masking – Influence of stimulus size and eccentricity**

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In metacontrast masking the visibility of a target stimulus is reduced by a subsequent non-overlapping masking stimulus. Recent studies demonstrated stable qualitative individual differences in discrimination performance (Albrecht & Mattler 2012a, 2012b) which suggest two different neural processes that are weighted individually by each participant: the type-A factor produces typical increasing masking functions, the type-B factor produces decreasing masking functions. To determine critical parameters for the occurrence of individual differences we tested whether they hold true for different stimulus sizes as well as for different presentation locations. In a first session participants performed a discrimination task on metacontrast masked targets with centrally presented stimuli. In subsequent sessions participants performed the same task on small and large stimuli that were either presented foveally or with 5° eccentricity. Results show that individual differences are determined by the interplay of both processes. Individual weights as estimated by factor analysis in the first session significantly modulate masking performance with large or centrally presented stimuli. With small or peripherally presented stimuli influence of the type-A process is still substantial but weaker whereas the influence of the type-B process is nearly diminished. Participants seem to adjust their individual weighting depending independently on stimulus size and eccentricity.

## **Bestimmung des subjektiven Risikoschwellenwertes von Time Headways mittels des Grenzverfahrens der Psychophysik**

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Für die Risikoeinschätzung von Abständen zu vorausfahrenden Fahrzeugen lieferte bisherige Forschung Evidenz für die Existenz eines Schwellenwertes für bewusstes Empfinden von Risiko. Risiko wird hiernach erst bewusst erlebt, sobald eine Time-Headway-Schwelle von 2,0 Sekunden unterschritten wird. Dieser Befund war konstant für unterschiedliche Geschwindigkeiten. Unsere aktuelle, experimentelle Fahrsimulationsstudie hatte das Ziel, diese Ergebnisse für die Variable Risiko zu bestätigen und eine effizientere Methode der Bestimmung von Schwellenwerten im Kontext halb-autonomer Fahrsituationen zu prüfen. Die hierzu genutzte allgemeinspsychologische „Methode des Grenzverfahrens“ war bisher im Kontext der Verkehrspsychologie kaum relevant. Versuchspersonen wurden für drei Geschwindigkeiten (50, 100, 150 Km/h) entweder eine aufsteigende oder absteigende Serie von Abständen präsentiert. Die Abstände waren systematisch nach dem pro Geschwindigkeit errechneten Time Headway ausgewählt. In der absteigenden Serie wurde ein Start Time-Headway-Wert von 4,0 Sekunden solange um 0,5 Sekunden verringert, bis ein Proband den Abstand als risikoreich empfand. In der aufsteigenden Serie wurde ein Time Headway von 0,5 Sekunden solange um 0,5-Sekunden-Schritte vergrößert, bis ein Proband den Abstand als nicht mehr risikoreich empfand. Der individuelle Schwellenwert war definiert als der Mittelwert zwischen diesen beiden Punkten. Das Grenzverfahren erwies sich als geeignete effiziente Methode zur präzisen Bestimmung des individuellen Time-Headway-Schwellenwertes. Die Anwendung für weitere verkehrspsychologische Fragestellungen wird diskutiert.

## **Age differences in automatic detection of rare stimuli in an auditory oddball experiment as revealed by the P3a component**

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Automatic orientation to unexpected changes in the environment is a pre-requisite for adaptive behavior. Involuntary orienting of attention in audition is triggered by different mechanisms including the processing of a rare, sudden onset of a tone or a deviation from a continuous stimulation. Studies applying the auditory oddball paradigm suggest that deviance processing in elderly people is impaired but little is known whether the processing of the sudden onset of a rare stimulus is similarly affected by aging. In a passive auditory oddball experiment, healthy participants of two age groups (19–38 years and 55–76 years) were presented with either frequent (600Hz tones; 90% of the trials) or rare (short environmental sounds; 10%) stimuli. These stimuli were presented in four conditions differing in the inter stimulus interval (ISI): 500ms, 1000ms, 3000ms, and 10000ms. By measuring event-related brain potentials (ERPs), we tested whether automatic processing of rare stimuli differs between the two age groups. The ERPs revealed effective novelty processing in both age groups irrespective of the ISI. Differences between the two groups were most prominent in the P3a time window, suggesting that healthy aging effects the automatic orienting of attention towards changes in the environment.

## **Odor emotional quality predicts odor identification**

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It is commonly agreed upon a strong link between emotion and olfaction. Odor-evoked memories are experienced as more emotional compared to verbal, visual and tactile stimuli (Herz, 1998). This effect seem to rely on the emotional quality of odor cues but contrary to this odors are poor retrieval cues for verbal labels. When ask to name a set of everyday odors correctly, performance rarely exceeds 50% (De Wijk et al., 1995). Here, a interference due to simultaneous processing in shared areas (Lorig, 1999) as well as poorly established odor-name associations (De Wijk et al., 1995) are discussed. To examine the relation between the emotional quality of an odor and its likelihood of identification, this study evaluates how normative emotion ratings based on the three-dimensional affective space model, using the Self-Assessment Manikin by Bradley and Lang (1994) predict the identification of odors. The best fitting logistic regression model includes squared valence and dominance and thus, points to a significant role of specific emotional features of odors as a main cue for odor identification. The stronger the (squared) valence rating and the more dominant an odor is perceived, the higher are the chances to identify the odor correctly.

## **On the role of mentalizing processes in aesthetic appreciation: An ERP study**

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We investigated the role of mental perspective taking in aesthetic appreciation of abstract visual art. Participants (non-experts) were familiarized with a fictitious artist via narrative information. Subsequently, pictures of abstract art were judged according to aesthetic liking either from participant's own perspective or from the imagined perspective of the fictitious artist (i.e. theory of mind condition), while response times and electroencephalogram were recorded. Aesthetic preferences from the latter perspective were appraised faster for negative judgments and more slowly for positive judgments than corresponding self-referential judgments. Event-related potential analyses revealed significant differences between the two tasks both within the preparation period (i.e., during the cue-stimulus interval) and within the stimulus presentation period. When asked to make judgments from the imagined perspective, participants showed a relative centro-parietal negativity during the preparation period (700–330ms preceding picture onset) and a relative centro-parietal positivity during stimulus presentation period (700–1100ms after stimulus onset). These findings suggest different sub-processes in aesthetic appreciation and judgment of visual abstract art from one's own vs. from another person's perspective. The implications for recent theories of aesthetic appreciation in respect to cognitive processing are discussed.

## **The Faces in Radiological Images – Fusiform Face Area Supports Radiological Expertise**

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The fusiform face area (FFA) has often been used as an example of a brain module that was developed through evolution to serve a specific purpose face processing. Many believe, however, that FFA is responsible for holistic processing associated with any kind of expertise. The expertise view has been tested with various stimuli, with mixed results. One of the main stumbling blocks in the FFA controversy has been the fact that the stimuli used have been similar to faces. Here we circumvent the problem by using radiological images, X-rays, which bear no resemblance to faces. We demonstrate that FFA can distinguish between X-rays and other stimuli by employing multivariate pattern analysis (MVPA). The sensitivity to X-rays was significantly better in experienced radiologists than in medical students with limited radiological experience. For the radiologists it was also possible to use the patterns of FFA activations obtained on faces to differentiate X-ray stimuli from other stimuli. The overlap in the FFA activation is not based on visual similarity of faces and X-rays but rather on the processes necessary for expertise with both kinds of stimulus. Our results support the expertise view that FFA's main function is related to holistic processing.

## **The relationship between Power Law Exponents, Weber Fractions and short Standard Durations**

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For the perception of short durations, Birkenbusch, Ellermeier and Kattner (Fechner Day 2013) found the exponent of Stevens' power law (Stevens, 1957) to depend on the size of the different standard durations used in the experiment. Because the previous studies only suggest a positive correlation between exponent and standard, the aim of the present study was to determine the exact functional relationship between different standard durations and the power law exponent. Additionally, the functional relationship between standard duration and the Weber fraction should be determined to compare both dimensions. Therefore, N =10 participants were required to adjust the duration of a comparison tone to specific ratios (´ 2, ´ 3, and ´ 6) of six different standard durations (0.1, 0.2, 0.3, 0.4, 0.5 and 0.6 sec) in a magnitude production experiment. Furthermore, the participants completed an adaptive 2AFC procedure with the same standard durations and a comparison tone either longer or shorter than the standard. For the Power Law, the results show a positive linear relationship between the duration of the standard and the estimated exponent, whereas the function relating the standard durations to the Weber fractions can be described by a negative linear relationship.

## **The influence of stimulus repetition on the time perception of brief intervals**

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The duration of rare deviant stimuli (oddballs) presented within a stream of homogenous standards is commonly overestimated, an effect referred to as the oddball effect. It has been argued that this effect does not reflect a temporal overestimation of oddballs but rather results from an underestimation of the standards' duration due to the continuous repetition of standards. The present experiment aimed to investigate this effect of stimulus repetition on perceived duration. In each trial, we presented two stimuli in succession, namely a standard stimulus of constant duration followed by a comparison stimulus of variable duration. The two stimuli could either be identical or different pseudo-words. Participants were asked to judge whether the comparison was shorter or longer than the standard. Novel pseudo-words were judged to last longer than repeated ones. This result is in line with other empirical findings which report similar effects of immediate stimulus repetition on the judged duration of more complex stimuli (e.g. photographs). Taken together, these results suggest that the repeated presentation of stimuli might indeed result in an underestimation of their duration and thus contribute to the temporal oddball effect.

### **Motivational influences in online environments**

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People have rich self-regulatory systems that guide performance in online and offline environments. In an experimental setting, we investigated whether the user is influenced by motivational cues in online environments. We expected that activating an achievement-related goal would have positive consequences for emotions and may subsequently lead to higher performance and well-being. Furthermore, we expected that motivational processes may differ depending on the goal orientation that was activated (performance vs. learning goal orientation). Experiment 1 showed that embedding achievement-related goals in an online-environment led to a higher association of a website with achievement. In Experiment 2, participants saw the achievement-related website and then completed a performance task online. The results revealed a better task performance, which was, however, only found for the participants with a performance goal orientation. Furthermore, participants with a performance goal orientation reported higher intentions to behave aggressively at the end of the experiment than people with a learning goal orientation. These results demonstrate that the activation of achievement goals on a website has consequences for strategies of people with performance goal orientations, but not for people with learning goal orientations.

### **Modality Shifting in Sequence Learning**

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The process of sequence learning is at the heart of human skilled performance and is essentially guided by the sensory environment. Thus, it is important to investigate the role of stimulus modalities in sequence learning. In the present study, we combined sequence learning in the serial reaction time (SRT) task and modality shifting. 32 participants had to respond to the identity of digits that were either presented in the visual or in the auditory modality. Importantly, there were two repeating patterns in the succession of the stimuli: a fixed digit sequence and a fixed modality sequence. The shifting between modalities resulted in a modality shift effect (MSE), describing the phenomenon that participants responded faster when the stimulus modality remained the same, whereas they responded more slowly when the stimulus modality changed between successive trials. Importantly, we found a modulation of the MSE through sequence learning. The MSE was especially large in the sequence blocks and comparatively small in the random blocks. Thus, the finding suggested that sequence learning enhanced the MSE. One possible explanation is that putting the learned sequence into action came more easily to the participants during modality repetitions than during modality shifts.

## **Sprachmapping der Broca-Region mittels Transkranieller Magnetstimulation (TMS) – Anwendung eines phonologischen Bild-Wort-Interferenzparadigmas**

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Die neurochirurgische Intervention von sprachkritisch gelegenen Tumoren erfordert die individuelle Identifikation der funktionell unverzichtbaren Hirnstrukturen. Der Gold-Standard ist nach wie vor die invasive Methode der direkten Cortex-Stimulation während einer Wach-OP. Analog zum intraoperativen funktionellen Mapping ist die Transkranielle Magnetstimulation (TMS) – auch „virtuelle Läsionstechnik“ genannt – eine vielversprechende Methode für die Verbesserung der präoperativen Planung. Ein initiales TMS-Sprachmapping über der Broca-Region unter Anwendung eines einfachen Bildbenennungsparadigmas zeigte qualitativ überwiegend phonetische Fehler in der Wortproduktion, die anatomisch im posterioren Gyrus frontalis inferior lokalisiert waren. Funktionelle Bildgebungsdaten zeigten hingegen, dass diese Cortexregion spezifisch an der Verarbeitung phonologischer Informationen bei der Wortproduktion beteiligt ist (Heim et al., 2008; 2009). Um Aussagen über die phonologische Aktivierung während des TMS-Sprachmappings zu gewinnen, haben wir ein Bild-Wort-Interferenzparadigma mit phonologischen Distraktoren verwendet. Phonologische Ähnlichkeit bewirkt einen „kognitiven“ Beschleunigungseffekt in Bezug auf die Sprachlatenzen, der in unserem Pilot-Verhaltensexperiment repliziert werden konnte. Unsere Annahmen zielten auf die anatomisch spezifische Aufhebung dieses Interferenzeffektes mit der „Inhibitionsmethode“ TMS. Die ersten Daten zeigten bei gesunden Probanden individuelle, der phonologischen Aktivierung zu Grunde liegende, anatomische Muster. Wenn das phonologische Interferenzparadigma in Kombination mit TMS ein zuverlässiges funktionelles Mapping erlaubt, können auch weitere linguistische Teilbereiche komplementär untersucht werden.

## **The Effects of a Comparative Mindset on Schadenfreude**

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Social comparison affects not only the self-concept and motivation, but also elicits specific emotions such as schadenfreude: the pleasant emotion which arises in response to another's misfortune. Schadenfreude involves (social) comparison as it only arises in relation to another person or group and is enhanced when the other person is superior and relevant on some comparison dimension. If schadenfreude is based on comparison, then priming a comparative mindset should enhance schadenfreude. To test this hypothesis, we manipulated social comparison mindset while holding the information about the schadenfreude target constant. In the comparison condition (N = 58) participants wrote down similarities and differences between the left and the right side of a sketch displaying animals in jungle, while participants in the no-comparison condition (N = 59) simply described the sketch. Afterwards, participants read a vignette about a high achieving student failing in an exam and gave schadenfreude ratings. Results showed that the comparison group reported more schadenfreude in response to the high achiever's misfortune than the non-comparison group. Present results indicate that mere priming of non-social comparison enhances schadenfreude. Further studies generalize the effect to priming with social relevant comparison stimuli (sketch of people) on schadenfreude.

## **Adjust your view! Wing-mirror settings influence distance estimations and lane-change decisions**

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To perform lane changes in traffic safely, sufficient distance to the subsequent vehicles is required. In the present study static photographs of traffic situations were presented, in which the subsequent vehicle was seen through the left wing mirror. Distance estimations to the vehicle (Experiment 1) and lane-change decisions (Experiment 2) were gathered in dependency of different wing-mirror settings: Varying the vertical setting resulted in low and high car positions in the mirror and varying the horizontal setting make the driver's own back door visible or not. Findings showed that a visible back door and a low vertical position of the vehicle lead to smaller distance estimations and more cautious lane changes. Consequently, these settings could serve to improve traffic safety.

## **Effects of sleep deprivation on prospective memory: A multinomial modeling analysis**

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The authors investigated the effect of 24 hours of total sleep deprivation on event-based prospective memory (PM), which is remembering to carry out an intention in the future. The sleep deprived group (n = 24) produced significantly more false alarms to distractor items than the control group (n = 25), while the control group showed higher accuracy in the ongoing task. Analyses with the multinomial process tree model of event-based PM (Smith & Bayen, 2004) revealed a higher prospective component for the sleep deprived group and a higher retrospective component for the control group. However, these differences were present in the first half of the experiment only. Possible explanations and implications of the results are discussed.

### **Resting-state brain connectivity of functional illiterates**

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Background: About 7.5 million adults in Germany cannot read and write properly despite several years of school attendance. They are considered to be functionally illiterate. Since the ability to read and write is crucial for being employed and socially accepted, we developed a special literacy training to overcome these deficits. Methods: A group of 20 functional illiterates was compared to 20 non-impaired adults matched individually for age and gender. Resting-state fMRI was used to evaluate group differences before and after training, and intervention-based changes in functional illiterates. Results: We found a number of different networks, e.g. the visual network and the central executive network, which showed reliable lower connectivity in functional illiterates before training compared to non-impaired adults. We could also show that participation in our literacy training resulted in changes in these networks in functional illiterates. Conclusion: These findings suggest that poor literacy skills are associated with differences in resting-state brain connectivity. Furthermore, we showed that learning to read and write in adulthood leads to changes in resting-state activity of the brain.

### **Anticipating words and word categories during reading: Extracting the neural substrates of predictive linguistic processes via combined fMRI and eye tracking**

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A conversation in a noisy environment, a friend looking for a missing word – on a daily basis, we are confronted with incomplete verbal information that allows to generate predictions regarding the missing input. Over the last decade, predictive processing as a core mechanism of human information processing has gained substantial interest (see e.g. Friston & Kiebel, 2009). Investigating linguistic predictions, however, bears experimental challenges, as predictions are not directly accessible to observation. Using combined eye tracking and functional magnetic resonance imaging in a delayed reading task, we offer one possibility to provide evidence for the existence of linguistic predictions in an experimental paradigm and assess predictive processes in the absence of simultaneously ongoing processing of incoming words. Conditions triggering the prediction of the word category of the missing word elicited enhanced neurophysiological activity in regions formerly implicated in sequential processing. If participants were able to predict a specific word, additional activity was found in areas commonly associated with (lexical-)semantic processing as well as visual processing areas. In sum, our results suggest that word prediction relies on the interaction of domain-general sequence processing systems with cortical language systems.

## **Signal–Detection and Dual–Process Accounts of the Effect of Emotion on Memory**

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Emotional memories are more often experienced as vivid recollections than memories of neutral events. But applications of the remember–know procedure (Tulving, 1985) to the study of emotional memories have raised the concern that increased rates of "remember" responses to emotional as compared with neutral stimuli might be due to a confound of response bias and measures of subjective retrieval experience (Dougal & Rotello, 2007). The present study examined some underlying assumptions of this response bias account by means of model–based analyses using a signal detection and a dual–process model. Extending the empirical basis to different study conditions with strongly arousing stimuli, the present study suggests that response bias is a non–negligible factor but genuine differences in the subjective retrieval experience remain even after controlling for response bias. Further, the results hint at some model–inherent problems in explaining remember–know judgments.

## **Olfaction influences steering behavior: Why cars shouldn't smell bad**

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Having longitudinal and lateral control over the vehicle is extremely safety relevant in car driving. Traffic psychology research examined many factors influencing both control domains. Studies mainly focused on visual, acoustic, tactile modalities and higher cognitive factors. However, research barely examined olfactory stimuli and their influence on driving performance. There is some evidence that these factors influence drivers' information processing in a way that is relevant for their driving performance. Therefore an experiment was conducted in which 24 subjects were exposed to either pleasant (e. g. pine tree) or unpleasant odours (e. g. cold cigarette). Before and after being exposed to either one of both odours, participants rated their affective status and completed the lane change task. Results showed that unpleasant odours significantly affected both, participants' mood and driving performance. Subjects felt significantly less positive after being exposed to unpleasant odours. Moreover, they performed worse in the lane change task when being exposed to unpleasant odours. It can be concluded that unpleasant odours induced negative affect and influenced driving behaviour. Taking into account that this study was conducted using adolescents, future research needs to address real drivers. Moreover these findings should be replicated in more realistic driving scenarios.

## **Development of a Cycling Anger Scale**

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Bicycles as serious means of transportation have gained relevance in recent years. Unfortunately, this development is accompanied by an increasing amount of cyclists involved in traffic accidents. Both trends are pronounced in urban areas. Traffic psychological research shows that especially anger and aggression among road users might lead to maladjusted driving and thereby to a higher accident risk. So far, research on emotions in traffic has been focusing rather on car drivers than on cyclists. To bridge this gap and to

suggest a measure assessing cyclists' anger experience in traffic, we developed a Cycling Anger Scale (CAS). On the basis of previous qualitative research a questionnaire was developed assessing cyclists' anger experience in interaction with their cycling environment. N=437 cyclists completed the questionnaire. Results of factor analytical reductions unfolded a final 23 items questionnaire of the CAS (alpha reliability = .81) with four subscales: car interaction, cyclist interaction, pedestrian interaction, and traffic surveillance. The CAS correlated significantly with the Driving Anger Scale for car drivers (DAS;  $r = .71$ ) and trait anger (STAXI;  $r = .37$ ) suggesting a valid and complementary instrument for measuring cycling anger in traffic. Implications for further research and for applied issues will be discussed.

### **Acrophobia impairs visual exploration and balance during standing and walking**

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Persons who are susceptible to visual height intolerance or acrophobia when exposed to heights exhibit typical restrictions of visual exploration and imbalance during stance and locomotion. Eye and head movements are reduced, and gaze freezes to the horizon. Eye movements are preferably horizontal saccades during stance and vertical saccades during locomotion. Body posture is characterized by a stiffening of the musculoskeletal system with increased open-loop diffusion activity of body sway, a lowered sensory feedback threshold for closed-loop balance control and increased co-contraction of the antigravity leg and neck muscles. Walking is slow and cautious, broad-based, consisting of small, flat-footed steps with less dynamic vertical oscillations of the body and head. Anxiety appears to be the critical symptom that causes the typical but not specific eye and body motor behavior, which can be described as tonic immobility. Guidelines for preventing acrophobia and as an add-on to behavioral therapy are recommended.

### **Limits of introspection in dual-task performance: What about motor interference?**

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Previous studies have revealed that in a dual-task situation, participants' introspection about their own performance is severely limited. Participants seem to be largely unaware of the dual-task costs that arise when two tasks are presented in close succession. In this case, responses to the second task are strongly delayed (i.e., the PRP effect) but participants' estimates of their reaction times do not reflect this delay. This finding supports the notion that response selection and conscious awareness are subject to the same attentional bottleneck. Other research has suggested that dual-task costs in reaction time can also arise at the motor level. Therefore, the present study examined whether introspection is also limited by motor interference. To induce motor interference, in the PRP paradigm we manipulated movement distance in Task 1 (i.e., participants produced either short or long movements). Reaction times showed the standard PRP effect and a propagation effect of Task 1 movement distance on Task 2. Participants' estimates of their reaction times did not reflect the PRP effect but did reflect the propagation effect. This finding supports the notion of a unified attentional bottleneck, and an additional motor bottleneck of which participants are consciously aware.

## Processing the existence presupposition of the definite determiner

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In a sentence like “Peter took the car” the definite determiner “the” signals that the existence of a car is required for the sentence to be true. We investigated how this existence presupposition (EP) is processed within a self-paced reading paradigm. Subjects first read five context sentences which either established the existence of a target like “the car” in “Peter has a car” or negated it (“Peter has no car”). In order to determine at what point in time the EP is first processed, subjects read a test sentence containing the target in a word-by-word manner. By mentioning the target either in the second or fifth context sentence it could appear far or near from its use in the test sentence which allowed us to trace possible effects of EP processing on memory. When the existence of the target was negated reading times increased shortly after its mentioning in the test sentence. This suggests that EPs are processed incrementally. The far or near distance of the target does not modulate this. The pattern of results indicates that a strong representation of a target entity is established during reading and that violations of EPs lead to serious problems in discourse understanding.

## Deduktiver und induktiver Grammatikerwerb beim Fremdsprachenlernen

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In vielen privaten und beruflichen Zusammenhängen ist das Beherrschen einer Fremdsprache von zentraler Relevanz. Eine kognitive Herausforderung beim Erlernen von Fremdsprachen stellt häufig der Erwerb der neuen Grammatik dar. In diesem Kontext stellt sich die Frage, mit welcher Lehrmethode Grammatiken möglichst effektiv und nachhaltig gelernt werden können. Dabei kann zwischen deduktivem und induktivem Vorgehen unterschieden werden. Beim deduktiven Grammatikerwerb werden bekannte Regeln mithilfe von Beispielen gefestigt. Beim induktiven Vorgehen werden dagegen zuerst Beispiele präsentiert, welche das eigenständige Herausfinden der zugrunde liegenden Regeln fördern sollen. Die in der Literatur bislang vorliegenden Studien kommen zu keinen übereinstimmenden Ergebnissen zu Gunsten der einen oder anderen Lehrmethode (z.B. Takimoto, 2008, Erlam et al., 2003, Haight et al., 2007) – ein Grund dafür könnten unterschiedliche Operationalisierungen und Rahmenbedingungen sein. Meine Dissertation widmet sich der Frage, welche der beiden Lehrmethoden zu einem größeren und nachhaltigeren Lernerfolg führt. Dieser Frage soll in einer Reihe kontrollierter Laborexperimente nachgegangen werden. Als Experimentalsprache soll Latein gewählt werden, welches die Vorteile natürlicher und künstlicher Sprachen verbindet. Mögliche Einflussfaktoren, wie die Aufgabenschwierigkeit oder das Alter der Lernenden, sollen dabei gezielt betrachtet werden. Damit soll ein Beitrag zum Verständnis der zugrundeliegenden kognitiven Prozesse beim Fremdspracherwerb geleistet werden, der idealerweise auch anwendungsrelevante Implikationen hat.

## Effects of delayed extended tactile feedback on tapping variability

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Users of sensorimotor assistance systems typically do not only have motor, but sensory deficits as well. Generally, it appears appropriate to integrate surrogate tactile feedback into such systems, as tactile information in healthy people is used by the motor system to make movements more precise and efficient. This way, users suffering from sensory deficits may be able to compensate for the missing natural sensory feedback. To evaluate the concept of surrogate tactile feedback, healthy participants were instructed to perform tapping movements in the context of a synchronization-continuation paradigm. Participants tapped with the right index finger in two isochronous rhythms. Extended Feedback was given with a electromechanical plunger, at the hallux of the left foot. Depending on condition, the extended feedback was delayed for 0, 12, 24 or 48 ms. A control condition entirely without extended feedback was also present. Without a delay, the inter-tap variability was on the same level as within the control condition. The variability within the delayed conditions was higher than the other two, but did not differ significantly from each other. This leads to the conclusion that extended feedback perturbs temporal motor coordination only when delayed, but not when properly aligned with the natural, proprioceptive feedback.

## Finding the odd one out: trivial need-of-help is a salient social stimulus for children

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This study explored the prioritization of socially relevant information by investigating children's processing of need-of-help versus basic categorical content using perceptually highly similar visual stimuli. Children (N = 47, 25 girls, M(age) = 8.06 yrs.) were asked to select the one picture out of four that was different from the others. Two tasks, each including two conditions, were implemented in random order: human-bird and need-of-help distinction (n = 80, 20 trials per condition). Accuracy was higher for bird, 84%, 95% CI [.78, .81], compared to child targets, 73%, [.64, .69], and for need-of-help, 84%, [.74, .79], compared to no need-of-help targets, 64%, [.58, .69]. Response times were fastest for child, Mdn = 3669 ms, [3520, 3903] followed by bird targets, Mdn = 4281 ms, [4104, 4458], and slowest for the two need-of-help conditions, Mdn = 6188 ms, [5901, 6540], and Mdn = 6500 ms, [6147, 6984]. These results suggest that need-of-help situations are more salient social stimuli compared to no-need-of-help stimuli. Need-of-help and human-bird categorizations were overall similarly accurate, but response times indicated that distinction of need-of-help content is more demanding than human-bird categorization. Accuracy and response times therefore likely reflect different processing requirements.

## **An Eye for Detail: Encoding the Social Gaze-cue in Multiple Object Tracking**

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Sensory processing can be actively modulated in a top-down manner. For example, knowledge alternates percepts of the same stimulus. One reason for this is a change in the allocation of attention. How does this affect a task whose successful completion already requires permanent re-allocation of attention? To demonstrate top-down effects in dynamic environments, we used the multiple-object tracking (MOT) paradigm and manipulated participants' knowledge. MOT requires participants to track a specified set of targets that move among identical looking distractors. Using cartoon eyes as stimuli, we implemented a gaze-cuing effect; either by the objects constantly "staring" or randomly "flirting" with a single other object (either a target or a distractor). In the first part, the observers were not aware of the eyes' gaze behavior. Before the second round of tracking, they received explicit information and indicated the condition after each trial. Results: (1) without information, the gaze-cue is not encoded during tracking, (2) with explicit knowledge, re-allocation of attention was measured, and (3) even when observers failed to identify the condition, the impact of the gaze-cue was strong. These results not only show that cognitive processing modes determine visual perception in attention-demanding, dynamic tasks, but also challenge theories of tracking.

## **Exemplars and rules in judgment: Measuring their relative impact**

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Different "modes" of cognition have been identified to explain judgment patterns in multiple-cue situations. According to rule-based accounts, people follow a sequence of steps to process cue information in order to achieve a judgment. In contrast, an exemplar process is thought to form a judgment by a similarity match to exemplars stored in memory from earlier experiences. The representation of information as well as the information structure of the task environment have been shown to trigger one or the other process. Hitherto, research has either relied on aggregate statistics (ignoring individual differences) or on crude strategy classifications (assuming that only one process is consistently used by an individual). This analysis is unsatisfactory at both the theoretical and the empirical level: First, modern theoretical accounts in categorization research emphasize the joint operation of both kinds of processes. Second, the crude classification of processes hampers fine-grained analysis. We present a simple mixture model that assumes both processes and allows to estimate a mixture parameter that measures their relative impact. Three experiments varying different aspects of the task (e.g. cue format, linearity of task environment) are presented that validate the mixture parameter but also point to limitations of the model.

## **The role of prospection in decision-making**

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The degree to which delayed rewards are de-valued over time (temporal discounting) is associated with a range of problematic behaviours, including substance abuse and behavioural addictions. The ability to project oneself into the future (prospection) can decrease temporal discounting, and presently, the “gold-standard” in measuring prospection is the Autobiographical Memory Interview (AMI). Data from a cohort of healthy adolescents revealed that the vividness of episodic prospection (i.e. number of episodic details produced) significantly correlates with the temporal discounting. In contrast, a separate study conducted in adult pathological gamblers (PG) did not reveal impairments in AMI-based prospection. Neuroimaging in PGs revealed the typical prospection-related activation in ventromedial-prefrontal and posterior cingulate cortices. Together, these results suggest intact episodic prospection abilities in pathological gamblers. The AMI measures prospection via subjective ratings, e.g. regarding the semantic and episodic content of the verbal reports that subjects provide. We also applied automatic feature extraction to quantify low-level text features that covary with these subjective ratings. Analyses revealed that prospection abilities, as measured using the AMI, correlate with low-level text features that can be extracted in a largely automatic fashion. Implications for the understanding of AMI-based prospection measures are discussed.

## **In touch or out of control: The influence of hand proximity on inhibitory control processes in younger and older adults.**

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Previous research has revealed preferential visual processing and enhanced inhibitory control for stimuli near the hands. However, based on experimental restrictions it is unknown whether this increased control is due to an unspecified visuospatial filtering process to centered targets or a better cognitive control per se. Our aim is to clarify the underlying mechanism and to investigate whether the inhibitory enhancement holds also true for older adults with age-related declines in executive control functions. In the present study, we use a modified visuospatial flanker task that requires a foveal adjustment of attention to non-centered targets in neutral trials. Thus, visuospatial filtering processes to central targets are inhibited. Forty older (60 to 69 years) and younger (20 to 29 years) participants have to solve 384 congruent, incongruent and neutral trials in four experimental blocks in a near hand (<10cm) and far hand (>30cm) condition. Reaction times and accuracy are measured. Only in case of cognitive control, we expect a general decrease of flanker interference for stimuli near the hands. This enhancement should become especially apparent for elderly based on a greater benefit of cognitive control. The results will be discussed with regard to multi-touch devices as a tool for cognitive control.

## **Diskriminierung macht am Computer nicht Halt**

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Im Rahmen meiner Promotion möchte ich die Grundlagen und Formen von Diskriminierungsverhalten im digitalen Kontext erforschen, erproben und Interventionsmöglichkeiten entwickeln um ein Voranschreiten von Diskriminierung stigmatisierter Gruppen in den digitalen Medien zu verhindern. Beginnen möchte ich bei PC-Simulationsspielen wie „Die Sims“. Dort bieten sich diverse Möglichkeiten Diskriminierungsverhalten zu beobachten und zu experimentell zu manipulieren (durch z.B. hohe Selbst-Involviertheit in Form eines der Testperson ähnlichen Avatars, durch die Anwesenheit von social desirability cues, oÄ). In dieser Simulation „echten Lebens“ ist es möglich das Vorkommen von stigmatisierten Gruppen wie z.B. Menschen mit Migrationshintergrund (Frauen mit Kopftuch), älteren Menschen und Frauen zu experimentell zu manipulieren und die Interaktionen mit diesen Gruppen zu beobachten und auszuwerten. Die dort zu findenden Daten möchte ich auf digitale Medien anwenden, in denen die soziale Interaktion nicht simuliert wird sondern tatsächlich stattfindet (z.B. soziale Medien wie facebook und Online Foren) um zu sehen ob das simulierte Verhalten der Spiele dem tatsächlichen sozialen digitalen Verhalten gleichzusetzen ist und wo eventuelle Unterschiede liegen. Aus den gewonnenen Erkenntnissen möchte ich ein Rahmenwerk schaffen, mit dem Diskriminierung stigmatisierter Gruppen nicht nur erkennbar gemacht wird sondern auch vorhersehbar und somit bestenfalls auch vermeidbar gemacht werden kann.

## **The unawareness of dual-task costs – delayed conscious awareness or timing demands?**

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The finding that participants are not aware of the dual-task costs in their own reaction times has been offered as support for the idea that attention is necessary for conscious awareness (Corallo et al. 2008; Marti et al. 2010). These studies propose that while participants attend to one task, they are not consciously aware of another because conscious awareness of the second task is delayed until a decision is reached on the first. However, we have evidence that using the original method (visual analogue scales) participants cannot accurately report the time intervals in dual-task contexts even when they are not also processing the dual-task. Using a new timeline method for collecting introspective reports of each dual-task trial, participants were able to fairly accurately report these intervals in the absence of dual-task processing demands. This new method offers us more insight into participants' representation of the temporal nature of a dual-task trial, and therefore allows us to better assess the effect of attention on conscious awareness. Results from experiments that investigated the effect of varying the dual-task processing demands on introspective reports (using this improved method) will be discussed.

## Valence processing is mediated by semantic meaning

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Evaluative priming is often referred to as a prime example of automatic valence processing. However, it is unclear whether valence per se or specific information of a given prime–target pair create the priming effect. Both, the response competition account (e.g., Klinger, Burton, & Pitts, 2000) and the spreading activation account (Hermans, De Houwer, & Eelen, 1994) are compatible with the idea that any clearly positive or negative prime will influence processing of any target of the same valence. This implies that specific features of prime–target pairs are irrelevant. In contrast, I will show that the priming effect is sensitive to specific prime–target features. Specifically, my data shows that independent ratings of semantic similarity explain 30% of variance in response time data in evaluative priming. Further, the evaluative priming effect is enhanced when prime–target similarity is enhanced by stimulus selection. Thus, not only valence is extracted from the prime but also specific features. Results are in line with parallel distributed network models (Masson, 1995) or compound cue-models (Ratcliff, & McKoon, 1988).

## Online vs. Offline – Ein systematischer Vergleich zwischen Online– und Laborexperiment

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Online–Befragungen gehören mittlerweile zum Standardrepertoire psychologischer Forschung. In letzter Zeit werden daneben auch browserbasierte Experimente im Web immer beliebter und zur Datengewinnung eingesetzt. Mögliche Probleme wie hohe Ausfallquoten oder geringe Motivation, sowie im weitesten Sinne eine geringe Validität werden seit längerem kritisch diskutiert (Birnbaum, 2000). Umso überraschender ist es, dass kaum empirisch vergleichende Untersuchungen zwischen identischen Online– und Laborexperimenten durchgeführt werden. Anhand eines vergleichsweise eintönigen Experiments zur Schätzung von Häufigkeiten werden beide Verfahren an studentischen Stichproben durchgeführt und miteinander verglichen. Empfehlungen für den Einsatz von Onlineexperimenten werden abgeleitet.

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## **„Snackomat“ – Eine Technologie zum Initiieren von Gesprächen zwischen Personen in Wartesituationen**

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Wartesituationen werden in vielen Fällen als unangenehm erlebt. Spontane Gespräche zwischen den Wartenden haben das Potenzial, Wartesituationen angenehmer erleben zu lassen. Basierend auf Ansätzen des Experience Design und Positive Design wurde ein Automat für Wartesituationen entwickelt, der Wartende gratis mit kostenlosen Snacks versorgt und dabei Möglichkeiten für spontane Gespräche (Smalltalk) schafft. Ziel war es, die Wartesituation zu einem positiven Erlebnis zu machen. In einer experimentellen Studie sollte ermittelt werden, ob die Reaktionen von Wartenden in einer die Wartebedingung mit ‚Snackomat‘ positiver ausfallen als in einer Kontrollbedingung mit einem Kaffeeautomaten. Analysiert wurden das Kommunikationsverhalten und das Erleben durch verschiedene Fragebögen u.a. zu Erleben der Wartesituation, Stimmung und Bedürfniserfüllung. Insgesamt 59 einander unbekannte Teilnehmer wurden in Dreier- und Vierergruppen unter einem Vorwand in eine Wartesituation der beiden experimentellen Bedingungen gebracht. Die Ergebnisse zeigen, dass der ‚Snackomat‘ die Menschen signifikant mehr zu Gesprächen animiert und mehr Spaß in die Wartesituation bringt (z.B. wird mehr gelacht). Zudem hatte der ‚Snackomat‘ größeren positiven Einfluss auf Gespräche und ließ die Wartezeit kürzer erscheinen. Es traten auch unerwartete Ergebnisse auf. So unterschieden sich die Wartenden der beiden Wartebedingungen nicht in ihrer Stimmung und in der Kontrollbedingung wurde mehr über persönliche Themen angesprochen. Diese Ergebnisse werden diskutiert.

### **The effects of regulatory focus on verbal and non-verbal interaction patterns during group decision-making**

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Theoretical background: Regulatory focus theory proposes a basic motivational duality with two self-regulatory systems: promotion focus and prevention focus. Although most of the work stimulated by regulatory focus theory has involved individuals, researchers have devoted increasing attention to the question of how a promotion versus prevention focus affects group processes and outcomes. In this context, the current study offers a novel perspective on regulatory focus that is distinctively group-level specific and cannot be derived from research on individuals. By combining behavioral observation with new measurement tools, we will investigate verbal and non-verbal interaction patterns associated with different foci. In doing so, we aim to show that regulatory focus does not only affect individual behavior within a group but also group member interaction. Methods: Our sample consists of 43 three-person groups solving a sequence of decision-making tasks. A situational prevention versus promotion focus was induced by framing the group task accordingly. Verbal interaction patterns were assessed using the Microcone®, a microphone that automatically recognizes speakers. To assess non-verbal behavior (e.g., interpersonal distance), we used the Kinect®, a motion sensing device. In addition, group interactions were videotaped and manually coded. Results/Discussion: Data collection and analyses are currently being conducted. Group interaction patterns will be investigated using lag sequential analysis.

## **Effects of load and distraction on alpha oscillations in a visual short term memory task**

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Our ability to hold information in visual short term memory is limited to a small number of objects. Since VSTM representations are volatile, they need to be protected against distractors, i.e. irrelevant concurrent stimuli. Previous studies have observed that during a delay interval, the power of alpha oscillations in EEG/MEG increases with the number of items that are memorized throughout the delay. Since alpha oscillations are known to indicate a state of cortical inhibition, this effect has been interpreted as a neural mechanism for distracter suppression, assuming that higher memory load requires stronger distractor suppression. However, most previous studies did not manipulate the strength of distraction directly. In the present study, participants memorized the orientation of line objects. Across trials, we varied the number of items to be memorized and the presence of distractors in the delay interval. A modeling analysis showed that distractors increased the guess rate and reduced the precision within which an item could be retained. As reported in previous studies, alpha power increased with memory load. However, alpha power decreased in the presence of distractors, conflicting with the interpretation of alpha oscillations as a mechanism for distractor suppression.

## **Differential effects of alerting signal intensity in feature vs. conjunction visual search**

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It is well established that the presence of an alerting signal (AS) reduces reaction times (RT), although it is unclear which stages of processing are affected by an AS. Here we extended these results by showing that increased AS intensity can also influence performance in visual search tasks. In a series of experiments, AS intensity and set size were manipulated in tasks where the visual target (i.e., L or T letters) has to be detected. The type of search could be feature or conjunction based. Results with the feature search task showed faster RTs with increased AS intensity, which was independent of set size. With conjunction search, however, the increased AS intensity both decreased RTs and accentuated the slope of the search function (i.e., the linear increase in RT with set size). These results suggest that increments of AS intensity reduce RTs also in tasks involving control but low perceptual load (feature search). At the same time, AS intensity may impair the effectiveness of the search mechanism.

## **The impact of cognitive effort on information integration in memory-based inferences**

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The recognition heuristic (RH) constitutes a very simple model of probabilistic inferences from memory, suggesting that people make comparative judgments by relying on recognition in isolation. Although this implies that all other information is ignored, research has shown that this is not generally the case. Rather, further knowledge is, at times, integrated. However, relatively little is known about what determines the integration of further knowledge. We address this question in three experiments that test the adaptive strategy selection hypothesis: Information integration depends on (1) how easily accessible information beyond recognition is, (2) how much confidence decision makers have in this information, and (3) how cognitively costly it is to acquire it. Specifically, we test the idea of a trade-off between accuracy and effort by manipulating (a) the availability of information beyond recognition, (b) the subjective usefulness of this information, and (c) the cognitive costs associated with acquiring this information. In line with our predictions, we observed that RH-use (as compared to information integration in terms of an equal weights strategy) decreased with increasing information accessibility and confidence in its validity, but increased with increasing cognitive costs of acquiring information.

## **An fMRI investigation on the role of parietal and sensory cortices in time**

**-variant enumeration processes**

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Recent studies showed that we can comprehend numbers over various presentation formats (e.g. Arabic numbers, dot-arrays) and targeted IPS as a common key region for number perception. This led to the idea of 'abstract number sense' which refers to innate machinery that enables us to comprehend numbers in a format and modality-independent manner. Yet, despite the number of studies on format-invariance, supramodality is still in question. Hence, this study aimed at investigating nonsymbolic number perception in visual and auditory domains, separately. We presented participants with sequences of auditory (beeps) or visual (flashes) numerosities (5,7,11,16) while measuring brain activity with a 3T MR-system. Subjects were merely exposed to auditory or visual numbers in 80% of the trials and they had to compare two successive numbers in the remaining trials. Yet, when a number was presented, they were naive to whether they will have to make a comparison with it later on or not which helped us keep them attentive, assess how accurately they actually perceived numbers and separate number perception from comparison that were mostly intermingled in previous studies. Interestingly, IPS was activated only during comparison but not during mere number perception. We further conducted MVPA and SVR to see if we can decode numbers within a modality and/or generalize a classifier trained to decode numbers in one modality (e.g. visual) to the other modality (e.g. auditory) which would be an eminent proof for modality-independence. Yet, the classifier reached significance during mere number perception only in sensory cortices (i.e. auditory cortex for auditory numbers and visual cortex for visual numbers) and remained at chance level in differentiating numbers in all the parietal ROIs for both modalities. In contrast, we were able to decode numerosity during comparison in a task-based parietal ROI. Taken together, our results don't support the idea that number estimation happens automatically in IPS irrespective of the format and modality as it wasn't engaged for the presentation format (sequential) we used in the absence of a task. We conclude that parietal cortex is not automatically activated for time-dependent numerical information and sensory cortices play a bigger role in the absence of an engaging task for time-dependent enumeration.

### **The effect of picture valence and movement direction on arm movement performance.**

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Several studies have shown that the space surrounding the dominant hand is associated to positive valence, whereas the space surrounding the non-dominant hand is associated to negative valence (Casasanto, 2009). Further studies examining whether this association is related to hand or side suggest a hand-valence association rather than a side-valence association (de la Vega et al., 2013). Based on these findings, the present study examines whether horizontally performed arm movements on a multi-touch device may influence reaction (RT) and movement time (MT) of affective IAPS-pictures (Lang et al., 2008). Two groups of right-handed participants were presented positive, negative and neutral pictures. One group moved the pictures with their right hand from left to right; another group moved the pictures with their left hand from right to the left. Preliminary results show a significant interaction between arm movements and picture valence on RT and MT. Right hand reaction were faster to positive and neutral pictures than to negative ones, left hand reactions are faster to negative than to positive and neutral pictures. Additionally, right hand movements were faster for positive and negative pictures than for neutral ones, left hand movements were faster for negative and neutral pictures than for positive pictures.

### **The Effects of Process and Outcome Accountability on Lossaversion**

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Accountability—the expectation to justify one’s actions to someone else—has been shown to affect biases in decision making. Vieider (2009) found that accountability reduces loss aversion—the tendency to weigh losses more heavily than gains of the same size. We sought to replicate this finding and to differentiate between outcome and process accountability. Process accountability has been found to enhance cognitive effort more than outcome accountability. Thus we hypothesized that accountable compared to non-accountable participants would have a lower tendency of loss aversion and that process accountability would reduce loss aversion stronger than outcome accountability. Accountability was manipulated by announcing an interview in which participants would have to justify their working process or outcome. Lottery gambles were used to measure loss aversion. No differences between the two accountability conditions and the non-accountable control group in their tendency for loss aversion were found. Furthermore, the two accountability conditions did not differ from each other. Hence, we did not replicate the original finding of a de-biasing effect of accountability. However, we found that participants in both accountability conditions spend more time on the task than the control group, suggesting increased cognitive effort.

### **Learning anticipatory eye-movements for control**

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Anticipatory eye-movements (or look-ahead fixations) are often observed in complex closed-loop control tasks, such as steering a vehicle on a non-straight path (Land & Lee, 1994). This eye-movement behavior allows the observer to switch between different visual cues that are relevant for minimizing present and future control errors (Wilkie, Wann, & Allison, 2008). Here, we asked: Are anticipatory eye-movements generic or are they acquired according to the learning environment? We trained and tested 27 participants on a control system, which simulated the simplified dynamics of a rotorcraft. Participants had to translate laterally along a specified path while maintaining a fixed altitude. Ground and vertical landmarks provided respective visual cues. Training took place under one of three possible field-of-view conditions (height x width: 60° x 60°; 60° x 180°; 125° x 180°), while testing took place in an unrestricted field-of-view environment (125° x 230°). We found that restricting the field-of-view during training significantly decreases the number of anticipatory eye-movements during testing. This effect can be largely attributed to the size of the horizontal field-of-view. Our finding suggests that anticipatory eye-movements for closed-loop control are shaped by the conditions of the training environment.

### **Task pair switching in the PRP paradigm and the role of inhibition**

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In the present study, we addressed the questions as to whether Task 1 (T1) and Task 2 (T2) in dual-task situations are represented as a higher-level task and whether information about this higher-level task is used to control dual-task performance. In Experiment 1, we used three task pairs by combining one from three visual tasks with an auditory task. To examine whether dual-task performance is controlled by cognitive mechanisms acting at a more global level of processing than that of subtasks itself, we varied the sequence of task pairs (task pair repetition vs. task pair switch) and the stimulus-onset asynchrony (SOA; 50 ms vs. 800 ms). In addition to a PRP effect, the data revealed switch costs in both tasks, implying that information about task pairs was activated in the course of dual-task performance. As indicated by an interaction of SOA and task pair sequence, switch costs in T2 decreased with increasing SOA, thereby revealing that these costs seem to occur especially in situations of strongly temporally overlapping task processing. Using the same stimuli and tasks as in Experiment 1, we investigated in Experiment 2 if inhibitory control adjusts the activation of task pairs, by looking at N-2 repetition costs.

## **Meta-analyses of the anti-saccade task reveals functional differentiation in the frontal eye fields and posterior dorsomedial frontal cortex**

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The anti-saccade task is a standard paradigm to investigate flexible control over behavior. Here, we used meta-analyses to explore which areas are consistently differentially involved in the performance of pro- versus anti-saccades. We therefore compared the convergence in activations for experiments contrasting saccades vs. fixation to experiments contrasting antisaccades vs. saccades. This analysis revealed stronger convergence of activity for saccades in the posterior supplementary motor area (SMA), the lateral parts of bilateral frontal eye fields (FEFs) and the right superior parietal lobe. In contrast, antisaccade-specific consistency of activity was found in more medial parts of the FEFs, right anterior mid-cingulate cortex (aMCC) and right precuneus. Additional task-dependent and task-independent functional connectivity (FC) analyses revealed the lateral FEFs and SMA to show increased FC with regions associated with motor output, such as the precentral gyrus, SMA, cerebellum and basal ganglia. In contrast, medial FEF and aMCC revealed stronger FC to regions that are involved in higher cognitive control. Differential functional roles of lateral versus medial FEFs and SMA versus aMCC in eye-movement control as revealed by meta-analyses are thus well complemented by network analyses suggesting that these regions are involved in a motor output network versus a cognitive control network.

## **Can specific emotions be detected shortly before an insight solution occurs? Evidence from video recordings of problem solvers' faces**

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Insight is often reported to be accompanied by the so-called "Aha! experience", a strong affective response to suddenly finding the solution to a difficult problem. The Aha! experience is typical for insight and could be taken as a discriminative criterion to set it apart from intuition. The present work investigated the emotions that occur during Aha! experiences by observing participants' facial expressions. 48 participants were filmed with a video camera while they worked on 34 difficult problem solving tasks. Upon solving a problem, they had to report whether they had experienced an Aha! or not. The entire task lasted about 30-45 minutes. We compared smiling rates for solved vs. not solved tasks, and for insight vs. noninsight solutions, as well as participants' emotional expression shortly before a solution. Data analysis is ongoing, but we hope to be able to report the full results at the TeaP symposium in March 2015.

### **Motor planning and control: You interact faster with a human than a robot**

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Motor resonance (MR) has been a prominent idea to explain online motor control strategies. To date there is little evidence for this idea in online motor control tasks using realistic social interactions. Here we set out to test one important prediction of MR in realistic social interactions, namely that the visual human-likeness of the interaction partner should modulate online motor control. We used a novel virtual reality set up in which participants naturally interacted with a life-sized virtual avatar, who looked either like a human or like a robot (between subjects, 14 per group). Participants' task was to high-five this avatar, whose hand position (on 50% of the trials) was randomly moved to one of four locations during motor execution (online motor control task: identical kinematics of both avatars). We tracked participants' hand positions with optical tracking. Hand trajectories showed that participants were faster in carrying out the high-five movements with humans than with robots. However, there was little evidence for a profound effect of the human-likeness on corrective movements during online motor control. This is first evidence that – as predicted by MR – motor control in social interactions is different for different human vs. non-human like interaction partners.

### **Masked visual letter identification is not affected by**

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Several studies of multimodal duration integration show that perceived visual duration is strongly affected by irrelevant auditory intervals with longer or shorter duration. It was suggested that this effect depends on perceptual processes by which the perceived onset/offset of the visual interval is pulled towards the auditory onset/offset, thereby altering the duration of the visual percept. Alternatively, however, participants might have intentionally responded to the auditory duration information. To distinguish these two alternatives (perceptual vs. decisional bias), we asked participants to identify backwards-masked letters presented alone or accompanied by shorter-, same-, or longer-duration sounds. Interstimulus interval (ISI) between letter and mask varied randomly from trial to trial. If perceived auditory duration affects the duration of the visual percept, longer and shorter auditory durations should enhance and impair letter identification accuracy, respectively. While accuracy improved with ISI duration, it was not affected by auditory duration. Interestingly, reaction times were faster when letters were accompanied by sounds rather than presented unimodally, but only for short ISIs. Therefore, these results do not provide evidence for an increased persistence of the visual percept by multimodal integration, but rather argue for a post-perceptual locus. However, the presence of sounds speeds decisions, when perception is difficult.

**The role of fluency for the association between valence and left/right:  
Evidence from foot responses**

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Recent studies have provided evidence for an association between positive and negative valence and the dominant vs. non-dominant hand. This association is thought to emerge because of the different degrees of fluency of the dominant and non-dominant hand; thus, according to this assumption, fluency serves as the link between dominant hand and positive affect, and non-dominant hand and negative affect. We investigated this idea in a valence judgment task in which right-footed participants responded with their right vs. left foot to positive and negative words. Depending on the degree of fluency of their right foot, participants differed with regard to whether they showed an association between valence and left/right, or whether they did not: Strong right-footers responded faster with their right foot to positive words and with their left foot to negative words, whereas no such interaction showed for weak right-footers. The results support the assumption that fluency lies at the core of the association between valence and left/right.

**Age-Related Differences in the Modulations of Late Positive Potential  
during Emotion Regulation Between Adolescents and Adults**

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Although the general ability of emotion regulation in human is thought to improve with age, fewer studies have considered age-related changes of the reactivity effect and the regulation effect during emotion regulation from adolescence to adult. To address this issue, Reactivity and Regulation-Image Task (REAR-I Task) was utilized upon 40 participants (18 young adolescents and 22 young adults) to examine the modulation of the late positive potential (LPP) that indexed both reactivity and regulation effects when participants using up- and down-regulation to the emotional pictures. The results of the study indicated that: (a) only under the up-regulation conditions, adults' subjective ratings of emotion experience intensity were higher than the ratings of adolescents; (b) emotional stimuli evoked significantly larger LPP than neutral stimuli in both age groups; (c) overall higher amplitude of LPP during emotion regulation processing was observed in adolescents than in adults; (d) adolescents showed higher amplitudes of LPP than adults when using different regulatory strategies in the middle and late time windows.

**Action as a unifier of perceptual experience:  
action–effect learning promotes multisensory integration**

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Conscious experience requires that sensory information processed by separate brain areas is integrated. The integration of different sensory modalities strongly depends on whether these modalities are perceived simultaneously. However, sensory processing time might strongly differ between modalities. Thus, the brain must be able to adapt to these differences and recalibrate its perception of synchrony. Here we report a study that investigated whether the ability to predict the specific auditory and visual outcomes that an action produces, promotes the temporal integration of these two modalities. We observed that temporal recalibration occurs only when auditory and visual outcomes are expected compared to unexpected outcomes. We did not observe any temporal recalibration of stimuli that were predicted from visual cues. Our findings suggest that action promotes the temporal integration of predicted auditory and visual outcomes into a single audio–visual event. Actions structure the perception of our environment binding multimodal features together in order to create a coherent representation of the external world.

**Error related brain activity predicts conscious classification of different error types**

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Francesco Di Gregorio, Marco Steinhauser, & Martin E. Maier. We investigated whether performance monitoring activity at the time of the erroneous response foreshadows conscious distinction between different types of errors. On each trial, three geometrical shapes were simultaneously presented, one in dark red, one in medium red, and one in light red. Participants identified the medium red shape by executing a corresponding response. After the response, participants indicated whether they thought having answered correctly, erroneously to the lighter shape or erroneously to the darker shape. Thus, two types of consciously detected errors could be analyzed: correctly classified errors and falsely classified errors. Surprisingly, stronger electrophysiological (error–related negativity) and behavioural (post–error slowing) indices of performance were found for falsely classified errors. As false error classification implies that the task goal of correct error classification was violated, stronger error monitoring for falsely classified errors suggests that the error classification task is integrated into the task set of the primary task. False error classification should be more likely with insufficient processing of the darker and lighter shapes (less distributed attention). Thus, the performance monitoring system could predict the risk of each error type by monitoring the state of the attentional system during task processing in order to optimize performance.

## **Answer-until-correct responding improves the validity of multiple-choice tests**

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The Answer-until-correct technique (AUC) is an alternative response format for administering multiple-choice questions that allows test takers to answer repeatedly until they identify the correct answer. By determining how many attempts a test taker needs to successfully solve an item, AUC allows to capture partial knowledge and provides test takers with direct feedback on their performance. Previous studies investigating the procedure were mostly based on a correlational approach, and found AUC to improve the reliability of multiple-choice tests. With regard to test validity, results were inconclusive. We present the first study using an experimental approach to determine the reliability and validity of AUC testing. After experimentally inducing different levels of knowledge to create an external validation criterion, we employed the Immediate Feedback Assessment Technique – a paper-pencil implementation of AUC – to assess the induced knowledge. In classroom assessments of pupils aged from 9 to 13 years, we found AUC responding increased the validity of a multiple-choice knowledge test as compared to the standard multiple-choice response format. Different AUC scoring schemata moderated this result.

## **Processing payoffs in a perceptual decision task**

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Payoffs may affect choice frequencies in perceptual decision tasks. Several studies investigating this effect have shown that sequential sampling models account for choice probability and choice response times when applying different payoffs (e.g., Diederich & Busemeyer, 2006; Diederich, 2008; Rorie et al. 2010; Gao et al. 2013). These studies found that a process in two stages (first processing the payoffs and then the perceptual discrimination task) accounted best for the data. Here I investigate further how the two processes are interlinked, and whether processing occurs serially. Three different experimental setups are employed in which the order of information is manipulated. A multi-stage sequential sampling model account is shown for different processing orders

## **The influence of social support in a discriminatory situation on target's protest behavior**

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This study examined whether social support, offered to women who had been targets of sexist discrimination, influences their protest behavior. Specifically, we investigated the role of the helping person's group membership (implemented using gender). As potential mediators, group efficacy, self efficacy, and self-esteem were assessed. We hypothesized that (1) social support by an in-group member leads to increased group efficacy, self efficacy, and self-esteem, which results in more protest behavior. (2) Due to its paternalistic connotation, social support by an out-group member leads to decreased group efficacy and results in less protest behavior. Female university students (N = 44) heard two sexist remarks made by a male experimenter. Following the sexist remark, a confederate (female vs. male) offered social support through an explicit complaint about the experimenter's sexist behavior. In the control condition, no other person was present (= no support). Results showed that, independent of the condition, participants rarely protested against the discriminatory remark. Nevertheless, support of a female confederate led to increased group efficacy, self efficacy, and self-esteem. However, female participants reported more perceived support if support was offered by a male than a female confederate. We discuss if women may have reinterpreted the discriminatory remark as bearable.

## **Children's and adults' generation of online emotional inferences in written and auditory texts**

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This paper presents the results of a study assessing the abilities of elementary school children and adults to infer the emotional state of a short story's main character. We measured the inference generation online and offline, that is, during and after a comprehension task. Online emotional inferences are traditionally measured with a reading-time paradigm. However, this design is not suitable for children, because the large variation in the decoding speeds of primary school children would bias the results. Therefore, we designed a new method for measuring emotional inferences, based on reaction times. We varied the presentation of the text (1) either written (which the participants were asked to read out loud) or auditory (read out loud by an adult), and (2) whether or not the text especially emphasised the protagonist's goal (for example, winning a contest) or only mentioned it. The results showed participants made emotional inferences, both during and after comprehension, in all age groups. Both reading out loud and the emphasis of goals were factors that positively influenced emotional inferences and general understanding of the text. The relevance of these results is discussed in terms of promoting the development of media literacy and emotional knowledge.

## **„...im Auge des Betrachters“: Interpretationsbias bei körperdysmorpher Störung**

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Ein negativer Interpretationsbias gegenüber ambiguen Szenarios wird als Faktor in Genese und Aufrechterhaltung der körperdysmorphen Störung (KDS) diskutiert (z.B. Buhlmann & Wilhelm, 2004). Erste Hinweise auf dessen Existenz lieferte eine Studie von Buhlmann et al. (2002) im Paper-Pencil-Verfahren. Ziel meiner Promotion ist die Erweiterung dieser Ergebnisse (1) i.S. einer Prüfung der ätiologischen Kausalität von Interpretationsbiases sowie (2) der Entwicklung eines Trainings zu deren Modifikation (CBM-I). Bisherige Forschung konnte zeigen, dass Interpretationsbiases bei Gesunden induzierbar (Yiend, Mackintosh & Mathews, 2005) und bei Patienten mit sozialer Phobie symptomwirksam manipulierbar sind (Beard & Amir, 2008). In meiner Promotion wähle ich ein dreischrittiges Vorgehen gemäß Hertel & Mathews (2011; Ansatz: assess – induce – modify). In allen Studien nutze ich für Messung und Modifikation eine Auswahlaufgabe (Wort-Satz-Passung) mit Reaktionszeitkomponente – das „Word Sentence Association Paradigm“ (WSAP; Hindash & Amir, 2012). In Studie 1 wird der Interpretationsbias bei Menschen mit klinischer KDS, generalisierter Angststörung, sozialer Angststörung und Gesunden gemessen. Ziel von Studie 2 ist die Induktion des körperbezogenen Interpretationsbias bei Gesunden, um Effekte auf die Biasausprägung und Stressvulnerabilität zu prüfen. In Studie 3 erhalten KDS-Patienten in 8 Sitzungen ein CBM-I-Online-Training. Das Outcome bzgl. Symptomschwere und Stressvulnerabilität wird mit einer Kontrollbedingung ohne Modifikation und einer Wartelistenbedingung verglichen.

### **Flexible Conflict Management:**

#### **Conflict Avoidance and Conflict Adjustment in Reactive Cognitive Control**

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Conflict processing is assumed to serve two crucial, yet distinct functions: Regarding task performance, control is adjusted to overcome the conflict. Regarding task choice, control is harnessed to bias decision making away from the source of conflict. Despite recent theoretical progress, until now, two lines of research addressed these conflict-management strategies independently of each other. The present research used a voluntary task switching paradigm in combination with response interference tasks to study both strategies in concert. In Experiment 1, participants chose on each trial between two univalent tasks. Switch rates increased following conflict trials, indicating avoidance of conflict. Furthermore, congruency effects in reaction times and error rates were reduced following conflict trials, demonstrating conflict adjustment. Experiment 2 employed bivalent instead of univalent stimuli. Conflict adjustment in task performance was unaffected by this manipulation, but conflict avoidance was not observed. Instead, task switches were reduced after conflict trials. In Experiment 3 tasks were used that comprised of univalent or bivalent stimuli. Only tasks with univalent revealed conflict avoidance, whereas conflict adjustment was found for all tasks. Based on established theories of cognitive control, an integrative process model is described that can account for flexible conflict management.

**The effects of experimentally induced positive and negative mood on feedback processing:  
An ERP study**

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Negative mood leads to concentration on failure and details whereas positive mood increases the use of schemas and heuristics. We examined whether mood would also influence feedback processing. Feedback processing can be examined online by means of the feedback-related negativity (FRN), an event-related potential (ERP) component which is most pronounced after subjects receive unexpected feedback. The P3, another ERP component, is related to stimulus probability and subjective value of a stimulus. To examine the influence of positive and negative mood on the ERP correlates of feedback processing, we induced positive or negative mood via imagination. Afterwards participants conducted a gambling task in which they were informed about the win probability (25%, 50%, or 75%) before every trial. Preliminary results show that irrespective of mood, the FRN is larger after losses than after wins, while the P3 is larger after wins. Surprisingly, no effect of expectancy was found. However, if the win possibility is low, the FRN after gains and losses is smaller than in conditions with high or equal win possibility. Also, a more pronounced FRN was found in the positive mood group, while the P3 is larger in the negative mood group.

**“Brainy” Math Cognition:**

**The Impact of Fluid Intelligence on Strategy Use in Arithmetic and Algebra**

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Individuals with high compared to average fluid intelligence (FI) perform better on math problems. They show less brain activity during task processing, especially for easier tasks. A greater flexibility in strategy use is also associated with better math performance and can be found in highly intelligent children. Strategies differ in their cognitive demand. Therefore, we analyzed whether FI related differences in neural efficiency result from differences in strategy selection/ execution. 63 grade 11 pupils with superior and average FI (BOMAT; Hossiep et al., 2001) were instructed to mentally solve arithmetic and algebraic problems with varying complexity as quickly and accurately as possible and then to choose their result out of several candidate answers. Response time, accuracy, eye movements (reflecting strategies), and event-related synchronization/ desynchronization in the EEG alpha-band (reflecting neural efficiency) were recorded as dependent variables. Participants with superior FI solved the more complex tasks faster than participants with average FI. Preliminary EEG results suggest that higher FI leads to a more efficient processing of the least complex tasks. Strategy reports indicate differences in strategy selection that are related to FI and neural efficiency. Further fine-grained eye movement analyses will indicate whether the more efficient processing in participants with superior FI results from the strategy selection and/ or execution.

## Occipitoparietal alpha-band responses to the graded allocation of top-down spatial attention

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The voluntary, top-down allocation of visual spatial attention has been linked to changes in the alpha-band of the EEG signal measured over occipital and parietal lobes. In the present study, we investigated how occipitoparietal alpha-band activity changes when people allocate their attentional resources in a graded fashion across the visual field. We asked participants to either completely shift their attention into one hemifield, to balance their attention equally across the entire visual field, or to attribute more attention to one half of the visual field than to the other. As expected, we found that alpha-band amplitudes decreased stronger contralaterally than ipsilaterally to the attended side when attention was shifted completely. Alpha-band amplitudes decreased bilaterally when attention was balanced equally across the visual field. However, when participants allocated more attentional resources to one half of the visual field, this was not reflected in the alpha-band amplitudes, which just decreased bilaterally. We found that the performance of the participants was more strongly reflected in the coherence between frontal and occipitoparietal brain regions. We conclude that low alpha-band amplitudes seem to be necessary for stimulus detection. Further, complete shifts of attention are directly reflected in the lateralization of alpha-band amplitudes. In the present study, a gradual allocation of visual attention across the visual field was only indirectly reflected in the alpha-band activity over occipital and parietal cortices.

## Autofahren im (An-)Gesicht der Frustration: Eine Fahrsimulatorstudie zur Untersuchung der Gesichtsmuskelbewegung von Autofahrern während frustrierender Verkehrssituationen

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Gerade unter Zeitdruck empfinden Autofahrer bestimmte Situationen, wie Baustellen oder lange Rotphasen, als frustrierend. Diese Frustration kann eine aggressive Fahrweise hervorrufen und das Unfallrisiko massiv erhöhen. Mögliche Fahrerassistenzsysteme, die diesem entgegenwirken können, müssten die Frustration des Fahrers also möglichst frühzeitig erkennen. Da Menschen affektive Zustände durch Veränderungen in der Gesichtsmuskelaktivierung ausdrücken, scheint eine Videoüberwachung des Gesichts ein erfolgsversprechender Ansatz zur Erkennung von Frustration zu sein. Folglich untersucht diese Studie, inwiefern sich das Facial Action Coding System (FACS), das einzelne Muskelbewegungen des Gesichts in Bewegungseinheiten (Action Units) einteilt, eignet um den Level an Frustration zu messen. Einunddreißig Probanden durchfuhren unter Zeitdruck mehrmals ein Stadtszenario im Fahrsimulator während ihr Gesicht auf Video aufgezeichnet wurde. In einem Teil der Fahrten wurden durch verkehrsbedingte Behinderungen (z.B. rote Ampel, langsames Führungsfahrzeug, Baustelle) bei den Probanden Frustration erzeugt (FRUST), während im Rest der Fahrten eine relativ freie Durchfahrt möglich ist (NOFRUST). Subjektiv bewerteten die Probanden die FRUST-Fahrten als hoch signifikant negativer (Self-Assessment-Manikin-Valenzskala) und als hoch signifikant frustrierender (NASA-TLX-Frustrationsskala) als die NOFRUST-Fahrten. Zurzeit wurden das Fahrverhalten sowie die Gesichtsmuskelaktivität der Probanden inferenzstatistisch ausgewertet. Die Ergebnisse werden im Rahmen des Beitrags vor dem Hintergrund der Entwicklung von Fahrerassistenzsystemen diskutiert.

## **Neuronale Aktivierungskorrelate übungsinduzierter Veränderungen in kognitiven Kontrollfunktionen im hohen Lebensalter**

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Kognitive Kontrollfunktionen, wie die Fähigkeit zur Aufrechterhaltung von und Selektion zwischen multiplen Aufgabenregeln in Multitasking- oder Aufgabenwechsel-Situationen, unterliegen einem starken altersbedingten Abbau. Solche altersbezogenen Veränderungen werden auf neuronaler Ebene mit einer reduzierten Effizienz fronto-parietaler Netzwerke assoziiert. Kompensatorische Trainingsmaßnahmen für Multitasking-Fähigkeiten versuchen, dieses Altersgefälle zu begrenzen, und zielen dabei sowohl auf eine Verbesserung trainingsnaher kognitiver Kompetenzen als auch auf eine breite Erhöhung der latenten neuronalen Basis kognitiver Funktionalität. Erste vielversprechende Befunde hierzu stammen von Anguera et al. (2013), die im hohen Lebensalter substantielle Zusammenhänge zwischen den kognitiven Gewinnen eines Multitasking-Trainings und neuronalen Signaturen kognitiver Kontrolle (d. h. übungsinduziert erhöhter mediofrontaler Power und fronto-posteriorer Kohärenz im Thetafrequenz-Band) nachweisen konnten. Die vorliegende Studie zielt auf die Sichtbarmachung ebensolcher Effekte neuronaler Plastizität im Alter mittels räumlich hoch auflösender funktioneller Magnetresonanztomografie. Schwerpunktmäßig sollen dabei die Möglichkeiten einer plastischen Re-Adjustierung der reduzierten fronto-parietalen Netzwerkeffizienz im Alter durch Übung im Aufgabenwechsel ergründet werden. Hierbei soll auch das Ausmaß erzielbaren (neuronalen) Transfers in strukturellen Aufgabensituationen untersucht werden. Zudem wird ein moderierender Einfluss interindividueller intellektueller Unterschiede auf die übungsinduzierten Veränderungen angenommen (Neubauer & Fink, 2009): eine höhere Intelligenz könnte im Alter einen entscheidenden Resilienzfaktor darstellen, der die Übungsgewinne noch verstärkt. Daher wird untersucht, ob sich die übungsinduzierten Veränderungen tatsächlich in Abhängigkeit interindividueller Ausgangsunterschiede in der Grundintelligenz differenziell darstellen.

### **The influence of a motivational game setting on a task-switching training in middle childhood**

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It has been well documented that the motivational enrichment of a training setting, such as by adding video-game elements, can modulate the outcomes of cognitive trainings, especially in childhood. However, little is known so far about whether and how motivational manipulations of the training setting may exert differential effects on motivation and cognitive-control performance. The present study provides a framework for disentangling the impact of a motivational game setting on the training motivation and on cognitive performance in a task-switching training in middle-aged children (between the ages of 8 and 11 years). We manipulated both the type of the training (single-task vs task-switching training) and the motivational setting (without vs with game elements) separately from another, and even ensured that training motivation was not confounded with training experience. Findings revealed that the pure motivational setting had a positive impact on the training situation, that is, on training willingness and on the specifically trained cognitive abilities. Importantly, this motivational benefit was independent from the modulations on performance induced by the training type. Yet, the motivational impact did not extend to untrained measures of broader cognitive control. The findings will be discussed in the light of differences in baseline susceptibility for motivational input between healthy and subclinical populations.

**Response repetition effects in task switching  
depend on the risk of accidental response repetitions**

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In task switching, response repetitions usually result in benefits if the task repeats, and in costs if the task switches. This interaction of response and task sequence can be explained by assuming that responses are generally inhibited, and only in task repetition trials this inhibition is counteracted by (positive) priming from the repeated relevant stimulus category. In previous studies it has been suggested that the strength of this response inhibition depends on the risk of accidental response repetitions. In the current study (Exp. 1) this risk was directly manipulated by varying the relative frequencies of response repetitions in a between-subjects design. The results clearly show that response repetition costs increase (and benefits decrease or even reverse) with a decreasing rate of response repetitions required, thus supporting the assumption of a risk-dependency of response inhibition strength. In a control experiment (Exp. 2), in which the ratio of task repetitions vs. switches was varied, and the ratio of response repetitions vs. switches was held constant, no such shift in the response repetition effects was present. This shows that the adaptation of response inhibition strength depends specifically on factors affecting the risk of erroneously repeating the previous response.

**Metacognitive accuracy in attentional performance**

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Research aim: Metacognitive monitoring is a central element of metacognitive processing exerting widespread influences on information processing. Yet, there is little research investigating metacognitive monitoring in other cognitive domains than memory. Therefore, the present study wants to assess metacognitive monitoring accuracy in another cognitive domain, namely attention. Methods: 60 healthy participants were asked to perform a German version of the Stroop test (Bäumler, 1985), which consists of three subtasks, namely colour word reading (CWR), colour patches naming (CPN), and interference (INT). Different judgements of performance (JOPs) regarding their performance in the subtasks (errors) were collected. Judgements were assessed before (pre) and after (post) performing the task. Results: ANOVA results indicate a greater accuracy for post-judgements than for pre-judgements for all three subtasks ( $F_{CWR} = 72,981$ ,  $p < .001$ ;  $F_{CPN} = 56,526$ ,  $p < .001$ ;  $F_{INT} = 103,040$ ,  $p < .001$ ). Accuracy was also influenced by task difficulty indicating that the monitoring ability decreased with increasing task difficulty, i.e. the more complex the task was the worse was the accuracy. Results indicate that accuracy in metacognitive monitoring ability of attention performance is similar to the results of memory performance.

## **Linguistic versus non-linguistic knowledge: Is there a difference between pink and sour trains?**

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The distinction between linguistic and non-linguistic knowledge is particularly relevant because it points to the status of compositionality in meaning composition. In a study by Hagoort, Hald, Bastiaansen, and Petersson (2004), the distinction between linguistic and non-linguistic knowledge has been challenged. Here we investigated the influence of sentence structure on the N400 complex. Our results replicated the findings by Hagoort and colleagues and showed that the N400 onset latency does not vary between linguistic violations ('Trains are sour') and non-linguistic world-knowledge violations ('Trains are pink'). Critically, the N400 complex was not affected by the sentence structure (generic vs. specific: 'Trains are pink' vs. 'These trains are pink'), but only by the noun-adjective combination. This questions the assumption that the N400 results obtained by Hagoort and colleagues reflect processes at the sentence level. Implications for future studies addressing the differences between linguistic and non-linguistic knowledge will be discussed.

## **Attentional Bias bei Zwangsstörungen**

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In kognitiven Modellen der Zwangsstörung stellen verzerrte Informationsverarbeitungsprozesse einen zentralen Faktor in der Entstehung und Aufrechterhaltung dar (Tallis, 1997). Bisherige Forschung im Bereich der Modifikation von Aufmerksamkeitsbiases konnte bei Angststörungen zeigen, dass ein Bias sowohl induzierbar (e.g. MacLeod, Rutherford, Campbell, Ebsworthy, & Holker, 2002) als auch experimentell manipulierbar ist (e.g. Amir et al., 2009; Amir, Beard, Burns, & Bomyea, 2009). Im Bereich der Zwangsstörungen liegt zurzeit eine Studie vor, die Biasmodifikation an Probanden mit subklinischer Kontaminationsangst zeigen konnte (Najmi & Amir, 2010). Im Rahmen meiner Promotion wähle ich ein dreischrittiges Vorgehen (assess – induce – modify) zur genaueren Exploration von Aufmerksamkeitsprozessen bei Patienten mit primärem Waschwang und Kontaminationsangst. In einer ersten Online-Studie wird bei Patienten der Aufmerksamkeitsbias mit dem Posner-Paradigma mit störungsspezifischem Wortmaterial gemessen. Über verschiedene Präsentationszeiten (100ms vs. 500ms) werden die Aufmerksamkeitskomponenten engagement und disengagement untersucht. In einer zweiten Laborstudie wird mit einer modifizierten Dot-Probe Aufgabe ein störungsspezifischer Bias bei gesunden Probanden induziert, bei dem die Kontingenz von cue und target experimentell manipuliert wird. Damit soll die Veränderbarkeit von Aufmerksamkeitsprozessen bezüglich Kontaminationsreizen überprüft werden. In einem dritten Schritt wird der Aufmerksamkeitsbias bei Patienten mit der gleichen Dot-Probe-Methode von Gefahrenreizen weg trainiert. Effekte des Bias auf die Angst vor Kontaminationsreizen werden exploriert.

## **Learning a sequence that does not exist– How action coding processes can facilitate and create implicit sequence learning**

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Our previous studies showed that if an implicit learning sequence is coded by response locations, a stimulus location sequence cannot be learnt concurrently. This can be well explained by the Theory of Event Coding (Hommel, 2004). When the feature location is activated, all related sensory (stimulus) and motor (response) aspects are co-activated simultaneously, leading to an interference between the two sequence types. Apart from this possible interference, our next question was whether this principle of functioning can also lead to a facilitation effect in implicit sequence learning. To test this, participants in the experimental condition first conducted an induction phase. They simply learned a mapping between stimulus and response locations with a random sequence. In the learning phase, they observed a stimulus location sequence without responding. Afterwards, they were switched to a transfer phase in which they received only a response sequence without a concurrent stimulus location sequence. Only participants who had received the mapping between stimulus- and response locations in the induction phase showed learning of the response location sequence in the test phase. Our results imply that simultaneously activating sensory and motor aspects belonging to the same distal feature can facilitate, and even create implicit sequence learning.

## **The moving influence of eyes: Response priming using gaze motion as primes**

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The response priming paradigm is a well-suited tool to investigate quick visuomotor processing, i.e., links between perception and action preparation. It refers to the finding that responses to a subsequent stimulus (the target) are influenced by a prior stimulus (the prime). Typically, responses are faster in compatible trials (prime and target elicit the same reaction) than incompatible trials (prime and target elicit different reactions). In the current experiments, we used biological and nonbiological dynamic prime stimuli: faces with moving gazes (leftwards or rightwards) which were compared to moving points, moving points within abstract geometric arrangements, and gazes in upside-down faces. We found overall large priming effects with a short stimulus onset asynchrony (SOA) of 300 ms. No differences were found between upright and upside-down faces. The other primes led to smaller priming effects. A longer SOA (600 ms) led to overall smaller priming effects, which again did not differ between upright and upside-down faces. The other primes showed no or even numerically negative priming effects. Results are discussed in relation to our previous results with response priming utilizing biological and motion stimuli, and different theories concerning positive and negative compatibility effects and (biological) motion perception.

## **Motivational consequences of anticipated aversive shocks**

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Several experiments examined motivational effects of anticipated electric shocks on action selection. Results showed that the anticipation of a shock facilitated selection of a response producing the shock relative to a response producing no shock. Response suppression was however facilitated when there was an opportunity to avoid the shock. These findings show that emotional response suppression is not unconditional but depends on the availability of a distal avoidance goal.

## **Voluntary Pupil Control**

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Size and responsiveness of the human pupil is determined by an antagonistic interplay of two muscle groups, governed by sympathetic and parasympathetic parts of the autonomic nervous system. Therefore, it is generally accepted that pupil dynamics provide direct and genuine insight into the user's cognitive and affective state but defy any voluntary control (Loewenfeld, 1993). With reference to initial research by Ekman et al. (2008) we scheduled a training concept and applied real-time feedback on pupil diameter changes to utilize mechanisms of operant conditioning and progressively enable voluntary control over the related dynamics. Eight participants completed seven consecutive sessions applying affective associations to intentionally expand pupil size or individual relaxation strategies to reduce it. Results demonstrate all subjects to voluntarily increase pupil size relative to baseline recordings. Thereby it became evident that performance improvement during a session at least equal the general increase of willful interference over the complete training period. Strategies to reduce pupil diameter had limited success. A retest after three months will evaluate the stability of our findings. However, it can be noted that pupil-based communication in HCI extends affective monitoring and may constitute an active input channel to reliably interfere by means of simple cognitive strategies.

## **Activating the mental timeline: Does irrelevant spatial information influence the processing of time-related information?**

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Theories of Grounded Cognition suggest the existence of a mental timeline running from back (past) to front (future). Consistent with this assumption response time (RT) studies have documented a space-time congruency effect during the processing of time-related information: participants responded faster to future-related linguistic information with forward arm movements and faster to past-related information with backward arm movements indicating an influence of temporal information processing on spatial responses. However, it is still unclear whether spatial information in turn can influence the processing of time-related words. To investigate this question, we conducted two experiments employing task-irrelevant spatial information. In both experiments participants vocally judged the temporal content of words presented auditorily via speakers behind or in front of the participants. Presentation location did not influence temporal judgment RTs when spatial location was completely task-irrelevant (Experiment 1). However, when participants had to respond to the spatial location of pseudowords in catch-trials, spatial location also influenced RT in temporal judgments trials: participants responded faster when future words were presented in front of and past words were presented behind participants (Experiment 2). This indicates that spatial concepts are automatically involved in the processing of time-related information when the spatial dimension is made salient.

## **Using pupillometry to track norepinephrine activity in adults with ADHD symptoms**

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Pupillometry is the measurement of pupil diameter. It is used in psychology research because it reflects activation in the brain related to solving cognitive tasks. The magnitude of pupillary dilation appears to be a function of the mental effort required to perform the task. For this reason Kahneman (1973) used the task-evoked pupillary response as the measure of processing load in his effort theory of attention. More recent work with non-human primates has confirmed that changes in pupil diameter directly relate to changes in locus-coeruleus norepinephrine (LC-NE) system activity (Rajkowski, Kubiak, and Aston-Jones, 1993). The LC-NE system plays an important part in regulating attentional resource allocation. This is particularly relevant to the study of ADHD, which has been associated with several neurotransmitters; the symptom of inattention in particular is thought to be related to dysfunctional norepinephrine modulation. The present research investigated differences in LC-NE activity between participants with ADHD symptoms, and healthy controls. Pupil diameter was tracked while participants completed a tone discrimination task. It was expected that participants with inattention symptoms, but not those with hyperactive/impulsive symptoms, would show a tendency towards larger baseline pupil diameters and smaller stimulus evoked dilations both of which represent task disengagement.

## **Social features weaken the influence of low-level saliency on overt attention**

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According to saliency-based attention models, viewing patterns on visual scenes can be predicted by the distribution of physically salient image parts. We assumed that social features in complex naturalistic scenes would be processed preferentially regardless of their low-level saliency and that, therefore, saliency-based attention models are particularly poor in predicting gazing behavior when social elements are present in the visual field. To test this hypothesis, our participants freely viewed color photographs of complex naturalistic social (e.g., including faces, bodies) and non-social (e.g., including animals, objects) scenes while their gaze was tracked. For data analysis, we calculated saliency maps for each photograph to reveal image locations that stand out from the background in terms of their low-level features (i.e., color, intensity contrast, orientation) and compared these saliency maps to participants' actual gazing behavior. We found saliency maps and fixation patterns to diverge significantly stronger for social scenes (Kullback–Leibler divergence, DKL) and, consistently, saliency maps predicted fixation patterns significantly worse for these stimuli (e.g., area under the ROC curve, AUC). These data demonstrate that the presence of social features weakens the influence of low-level saliency on overt attention and, thereby, strongly challenge the generalizability of saliency-based attention models.

## **Hands on the table! Stimulus–hand distance does not modulate the flanker effect, but the congruency sequence effect.**

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The proximity of one's own hands to a visual stimulus seems to influence its attentional processing. Both response facilitation and response costs have been found near the hands using different paradigms. While attentional orienting appears to be facilitated, shifting and disengagement appear to be hampered near the hands (Tseng et al., 2012). From these findings, we would expect heightened distractor interference close to the hands. However, Weidler & Abrams (2014) found reduced distractor influence in a response–conflict task, in the form of an eliminated Eriksen flanker effect (Eriksen & Eriksen, 1974), near the hands. They interpreted this reduction in response conflict costs as evidence for heightened cognitive control near the hands. Attempting to replicate this finding both in a classic flanker task and an affective flanker paradigm and using a much larger sample, we found no evidence for a modulation of the flanker effect by hand position. Rather, we found robust flanker effects in each condition, thereby failing to replicate the finding by Weidler & Abrams. However, the congruency sequence effect (CSE; Gratton et al., 1992) was eliminated near the hands. This result indicates that adaptive cognitive control may yet play a role for information processing in peripersonal space.

## **Connecting spatial and social cognition: the case of perspective-taking**

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Empathic perspective-taking is inevitably described using spatial locatives (“try to understand my point of view”) and involves a metaphorical “merging of the self and other”. Recent research found that visuo-spatial perspective-taking involves an actual embodied merging of the self and other. Yet, the two kinds of perspective-taking are treated as independent of each other. We report evidence that visuo-spatial perspective-taking can have psychological effects, too. Participants completed a visuo-spatial perspective-taking paradigm, where they had to grab an object from another person’s point of view. Prior research has shown that this leads to a mental self-rotation of participants’ body schema into the target’s position – a literal merging of the self and the other. Across multiple studies, we show that after visually taking the perspective of another person, participants’ thoughts and feelings were in line with that person’s thoughts and feelings, too. Finally, imbuing the target of the visual perspective-taking task with psychological characteristics (i.e., the target is a good/bad person) can also affect the speed of visuo-spatial perspective-taking. First results hint at a bi-directional link between the different kinds of perspective-taking.

## **The influence of uncertain feedback on learning and feedback-related brain activity**

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For adaptive decision-making it can be important to not only consider feedback valence, but also whether a provided feedback is likely to be valid or not. The present study investigated how learning from feedback is influenced by uncertain, i.e. potentially invalid, feedback. We analyzed electrophysiological markers of feedback processing, the feedback-related negativity (FRN) and feedback-P300, in a simple decision-making task, in which participants received feedback color-coded as certain (100% valid) or uncertain (75% valid). For half of the participants feedback certainty was constant within blocks, whereas it varied within blocks for the other half. We found that uncertain feedback impaired test performance and attenuated the feedback-P300 amplitude, suggesting that it was processed less strongly. Further, we found that when feedback certainty was constant it did not affect the FRN, whereas for varying feedback certainty we obtained the typical effect of feedback valence on the FRN for certain feedback only. Together, our results show that participants were incapable of ignoring feedback uncertainty information. Moreover, these results suggest that feedback stimuli were evaluated relative to each other, i.e., that with varying feedback certainty uncertain feedback was processed similar to negative feedback.

## Welche Kontrolle kann es über unbewusste Informationsverarbeitung geben?

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Häufig besteht die implizite oder auch explizite Annahme, dass nur für bewusst repräsentierte Informationen die Möglichkeit besteht, ihren Einfluss auf das Verhalten zu kontrollieren, während gleichermaßen für unbewusste Information gilt, dass diese automatisch, also unkontrollierbar, in die Handlungssteuerung einbezogen wird. Dabei kann es leicht zu einer dichotomisierenden Betrachtung des gesamten kognitiven Systems kommen, bei welcher der „bewusste Teil“ mit den eigenen Zielen, Motiven oder auch allgemeiner dem „Selbst“ zu korrespondieren scheint, während zu dem „unbewussten Teil“ wenig Beziehung empfunden wird und welcher möglicherweise sogar unbemerkt und unkontrollierbar, eigene Entscheidungen und Verhaltensweisen kontaminiert. Ziel meiner Arbeit soll es werden, einen weiteren Schritt in der Förderung des Verständnisses der Beziehung bewusster und unbewusster Verarbeitungsprozesse zu unternehmen, indem, orientiert an Bewusstseins- und Handlungssteuerungstheorien (z.B.: Dehaene & Naccache, 2001; Hommel, 2007), aufgezeigt werden soll, welche Kontrolle bewusste Handlungsziele auf unbewusste Prozesse haben können, aber auch, welche Form der Handlungskontrolle an bewusste Information gebunden ist. Dabei soll anhand von Paradigmen des impliziten Sequenzlernens gezeigt werden, dass die Einbindung unbewusster Information in die Handlungssteuerung davon abhängig ist, welche bewusste Repräsentation der Aufgabe besteht. In ersten Experimenten zeigte sich, dass dasselbe unbewusst erworbene Sequenzwissen in Abhängigkeit eines anschließend für die Testsituation induzierten Task-Sets zum Ausdruck kam.

## Visual search for letters and words in letter arrays: performance and eye movements

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In visual search among complex stimuli, one of the most important issues is the problem of chunking. In our experiments, we studied visual search for letters in letter arrays, using a modified selective attention test. Observers searched for a prespecified letter in an array of random letters which included words. Target letters were either always or never embedded in those words. In the control condition, there were no words in the array. We discovered a dissociation of letter search efficiency (no statistically significant differences between the three conditions) and subjective representation of one's performance (drastic differences between the two experimental conditions). To understand this dissociation, we compared time-limited search for prespecified letters and search for words in the same letter arrays combining behavioral data and eyetracking. Search efficiency differed in the two conditions: letter search proved much easier than word search (mean search performance was 75% for letters and 46% for words). The pattern of fixations also differed: when searching for words, observers performed more fixations both between and within words. At the same time, almost all participants who searched for letters noticed words in letter strings. Thus, automatic word segregation is possible, but task-driven chunking is a resource-consuming operation.

## **Non-perceptual factors in offside situations in soccer**

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Judging offside in soccer requires a challenging demand for human observers and existing theories locate errors at a perceptual stage of processing (Mascarenhas et al., 2006). Most studies revealed a preponderance of flag-errors (i.e. a response bias in favor of the offside response), whereas a preponderance of non-flag-errors (i.e. a response bias in favor of the no-offside response) was reported for the English Premier League (Catteuw et al., 2010). A recent study on offside judgments in laypersons also observed more non-flag errors using static displays for simulating offside situations (Wühr, Fasold, & Memmert, submitted). Though a perceptual locus (e.g. flash-lag) for the bias was less likely with static displays, it could not be excluded due to some peculiarities of the experimental procedure. In two experiments, using static displays, we further developed this displays and decreased the possible impact of perceptual factors on offside judgments. In particular, the position of the observer was aligned with the (hypothical) offside line and the task was changed from a 2AFC task to a Go/NoGo task. Yet, both manipulations have no effect on error distribution and participants show a similarly significant preponderance of non-flag errors, suggesting a non-perceptual (e.g. motivational) locus for the effect.

## **Strategies for memory-based decisions: Modeling behavioral and fMRI data in a cognitive architecture**

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How do people use their real-world memories to make judgments about decision alternatives? A first strategy relies solely on recognition memory and chooses the alternative that was recognized or recognized more quickly. A second strategy retrieves further knowledge about the alternatives and bases its decision on this knowledge. A third strategy first evaluates recognition times of alternatives to determine if the decision can reliably be based on recognition information; if that is not the case the strategy retrieves further knowledge. To test these different notions of the decision process we implemented them as computational models in the cognitive architecture ACT-R, allowing us to derive predictions for decision times and the BOLD response. The model predictions were compared to results from an fMRI study where participants inferred which of two cities had more inhabitants. Overall, the third strategy provided the best account of the patterns in decision times and the BOLD response. These results provide insights into the conditions under which recognition is complemented by the retrieval of further knowledge and hint at an adaptive use of the two types of information. Further, the results illustrate how computational models can be combined with behavioral and fMRI data to account for how people apply and select information from memory to make decisions.

## **Analyse und Diagnostik räumlichen Denkens mittels Eye Tracking und Pupillometrie**

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Das Ziel der Studie ist eine Potentialanalyse der diagnostischen Möglichkeiten von Eye Tracking und Pupillometrie unter Verwendung von Stimulusmaterial zum räumlichen Denken. Mit Hilfe von Blickbewegungsmustern sollen kognitive Prozesse beim Lösen der Items identifiziert werden. Diese sollen im nächsten Schritt unterschiedliche Lösungsstrategien differenzieren. Die Vorhersage des Gesamtwertes des Tests durch die Messung der kognitiven Beanspruchung basierend auf der Analyse der Pupillenveränderung (Nutzung des „Index of Cognitive Activity“, ICA) bei der Bearbeitung weniger Items soll evaluiert werden. Ein weiterer Untersuchungsgegenstand ist das deskriptive und prädiktive Potential der Kombination beider Messgrößen. Welche zusätzlichen Erkenntnisse zur Beschreibung von kognitiven Prozessen können durch den ICA gewonnen werden? Was sagt die Blickbewegung bei der Bearbeitung eines Items über die Fähigkeit einer Person aus? Der Fokus liegt auf der optimalen Datenaufbereitung und Datenselektion für beide Größen sowie auf der Exploration verschiedener Algorithmen zur Bestimmung von Blickbewegungsmustern. Das Fernziel ist die Entwicklung eines adaptiven Tests unter Verwendung von Eye Tracking und Pupillometrie.

## **The influence of task complexity on the electrophysiological correlates of feedback processing in old age**

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Monitoring and evaluating the consequences of our behavior is important to flexibly adapt to a complex environment. In this study, we used an event-related potential (ERP) approach to examine the influence of task complexity on younger and older adults' ability to process feedback. For this purpose, we used a probabilistic learning task in which participants learned the assignment of pictures to response keys. In the simple version of this task, participants had to learn the assignments of six pictures to one of two response keys. In the complex version, six pictures had to be assigned to two of four response keys, respectively. Feedback processing was measured by means of the Feedback-Related Negativity (FRN), which is usually elicited in the ERP after unexpected negative feedback, and the P300 which reflects working memory updating after unexpected events. Preliminary results show that younger adults display a larger FRN and P300 after negative than positive feedback. Older adults additionally show a FRN after positive feedback. In the complex task, the P300 after positive feedback increased in both age groups. This suggests that with increasing task complexity, the processing of positive feedback seems to become more important during learning.

## **Selection of targets by attention towards modalities and time points: An ERP study**

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Attention serves to select a relevant stimulus under a variety of irrelevant stimuli. Research on attention has shown that there is not a single attentional system, but that many different attentional mechanisms contribute to selective processing. Whereas it has often been shown that modality-specific attention and feature specific attention enhance perception, the contribution of attention within time has been less investigated. In this study, we explored how modality-specific attention interacts with attention to specific points in time (temporal attention). We conducted an event-related brain potential (ERP) study in which participants had to detect target stimuli at pre-specified short or long time points and within a pre-specified modality (auditory or visual modality). The measurement of ERPs allowed us to monitor the interaction of attentional mechanisms as well as its temporal progression. We replicated the well-known effect of an early perceptual benefit for stimuli presented in the attended modality. In addition, our results show a modulation by temporal attention. Most importantly, modality-specific effects interacted with temporal attention. Since these interactive effects were present already at early ERPs, our results suggest interplays of temporal attention and modality specific attention at the perceptual processing stage.

## **The Reproducibility Project: Implications**

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The Reproducibility Project provides, at the most basic level, a repository of replication attempts in psychology. This may give us a better sense of the reliability of published studies in psychology, and what predicts reproducibility. But the Reproducibility Project serves a broader purpose clarifying the value of replication itself. Replication does more than confirm or deny effects – it also gives an idea about what environments foster good effect size estimates and thereby reproducibility. Since no replication is exact, replication is a means of generalizing effects across time, sample, setting, and procedural details. Replication is also a means of constraining by revealing boundary conditions and limitations on the observation of an effect. Thus the Reproducibility Project represents, in a broader sense a path towards delivering insight into the nature of psychological effects. The Reproducibility Project provides, at the most basic level, a repository of replication attempts in psychology. This may give us a better sense of the reliability of published studies in psychology, and what predicts reproducibility. But the Reproducibility Project serves a broader purpose clarifying the value of replication itself. Replication does more than confirm or deny effects – it also gives an idea about what environments foster good effect size estimates and thereby reproducibility. Since no replication is exact, replication is a means of generalizing effects across time, sample, setting, and procedural details. Replication is also a means of constraining by revealing boundary conditions and limitations on the observation of an effect. Thus the Reproducibility Project represents, in a broader sense a path towards delivering insight into the nature of psychological effects.

## **Getting the best out of eye-tracking research: An introduction to transparency standards.**

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The use of eye-tracking is rapidly growing in the field of judgment and decision making. Applications are diverse and the method proved useful as a means to record information acquisition and better understand the underlying cognitive processes involved in decision making. Because eye-tracking provides such valuable insights, but is also bound to assumptions about cognitive processes and data interpretation, reporting results of eye-tracking studies in scientific manuscripts poses a unique challenge. In a comprehensive evaluation of the published experimental literature between 2010 and 2014, using eye-tracking, we evaluate reporting norms and identify current shortcomings. Our goal is to present a set of guidelines aimed at the reporting practices of eye-tracking studies. A guideline like this must be responsive to the ideas of the research community, so we particularly looking forward discussing our suggestions with the audience.

## **Alerting Signals and Executive Control**

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Alerting warning signals are meant to optimize behavior in complex and error prone human-machine interactions and are thus often found in vehicles as “Lane Departure Warning Systems”, “Vehicle Headway Sensors”, or “Reverse Parking Sensors”. In recent research, however, we could show that alerting signals are especially beneficial in the initiation of reflexive response tendencies, which results in increased response conflicts when two response alternatives compete for control of action. Such increased interference effects have been explained by alerting signals impairing executive control or widening the scope of visual attention. In contrast, we interpret this finding as an alerting signal based enhanced memory retrieval process on the basis of acquired stimulus-response (S-R) links. In recent studies we could show that the alerting-increased interference effects critically depend on the existence of S-R links and that alerting signals reduced neural activity in primary visual cortex. We assume that alerting signals trigger a shift in cognitive control engagement to a stronger reliance on habitual memory-based reflex-behavior that may be accompanied with an increase of efficiency in information transmission from lower to higher cortices.

## **Simultaneous EEG and eye-movement recording in a visual scanning task**

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Eye-movements can result in large artifacts in the EEG signal that could potentially obscure weaker cortically-based signals. Therefore, EEG studies are typically designed to minimize eye-movements [although see, Plöchl et al., 2012; Dimigen et al., 2011]. We present methods for simultaneous EEG and eye-tracking recordings in a visual scanning task. Participants were required to serially attend to four area-of-interests to detect a visual target. We compare EEG results, which were recorded either in the presence or absence of natural eye-movements. Furthermore, we demonstrate how natural eye-movement fixations can be reconstructed from the EOG signal, in a way that is comparable to the input from a simultaneous video-based eye-tracker. Based on these fixations, we address how EEG data can be segmented according to eye-movements (as opposed to experimentally timed stimuli). Finally, we explain how eye-movement induced artifacts can be effectively removed via independent component analysis (ICA), which allows EEG components to be classified as having either a 'cortical' or 'non-cortical' origin. These methods offer the potential of measuring robust EEG signals even in the presence of natural eye-movements.

## **On the trot: Probing the interplay of honest and dishonest responding**

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Being dishonest is tricky. This is true even for dishonest answers to simple yes/no questions, where the agent needs to inhibit an automatic activation of the honest response to give way to its dishonest counterpart. These profound differences between honest and dishonest responding are mirrored in effects like prolonged response times (RTs) for dishonest behavior. Accordingly, responding honestly and dishonestly can be categorized as two distinct task sets and an alternation of the two tasks should result in switch costs, i.e., prolonged response times and higher error rates. We explore the notion of separate task sets in sequence analyses of RT data of two experiments. Participants answered simple yes/no questions about daily activities and the font color indicated if they had to respond honestly or dishonestly. Both experiments yielded reliable switch costs that appeared irrespective of whether the responses were given in close temporal succession (Exp. 1) or separated by an unrelated task (Exp. 2). The unrelated (probe) task further allowed us to assess genuine aftereffects of honest and dishonest responses, with dishonesty surprisingly yielding beneficial aftereffects as compared to responding honestly.

## **Looking at me? Influence of facing orientation of avatars and objects on distance estimation**

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Humans naturally keep a larger distance to the front of other people than to their back. Within three experiments we showed that such a front-back asymmetry is present already in perceived distances, and that it extends to objects as well as to human characters. Participants watched photorealistic virtual characters (avatars) and moving or static virtual objects (i.e., cameras) through a head mounted display. These were presented at different distances and were either facing the participants or facing away from them. Participants then estimated the perceived distance to cameras and avatars by moving a virtual object to this place. Both cameras and avatars facing participants resulted in shorter estimated distances than cameras and avatars facing away. This asymmetry was independent of the presented distance. Together with similar findings from similar experiments with virtual cones these results point towards a fundamental perceptual effect of object orientation. This orientation asymmetry effect does not depend on movement or object form and might indicate a basic form of social processing.

## **What is suspicious when trying to be inconspicuous?**

### **Criminal intentions inferred from nonverbal behavioral cues.**

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The present study investigates whether nonverbal behavioral cues to hidden criminal intentions during the build-up phase of a criminal act exist. To this end, we created recordings of actors once in a search situation and once committing a mock crime (theft or bomb placing) in a public crowded area. For ecological validation, we used authentic CCTV footage from thefts committed at an airport in Experiment 1. In this experiment, moving patterns in public space (e.g. rapid direction changes) and communication behavior (e.g. hand signs) were analyzed according to the difference of the expressed behavior in search and (mock) crime situations as well as compared to a bystanders' baseline. Experiment 2 was conducted to examine object-adaptors (e.g. use of objects like cell phone without instrumental goal) and self-adaptors (e.g. movements with hands on own body to calm oneself) as the behaviors of interest while controlling for inter-personal differences. The results of this study indicate that nonverbal behavior of offenders differs from nonverbal behavior of non-offenders. However, this holds only under the conditions of a valid baseline and of judging not only a typical behavior but a cluster of nonverbal behaviors as behavioral indicators during the build-up phase of a criminal act.

**Correlations between behavioral measures of risk taking,  
self reports, and real-life risk-taking behaviors**

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After decades of research, the essence of risk taking still remains unknown. Is one global factor or are multiple factors driving different real-life risk-taking behaviors? And how strongly do self reports of risk taking and behavioral measures collected in the lab correlate with risk-taking behaviors in real life? Using a large sample of 1,500 participants, we investigate these and related questions in the Basel-Berlin Risk Study. Our results support the view that risk taking is driven by several factors: Substance use and financial risk taking constitute two relatively uncorrelated factors of real-life risk taking. Self reports correlated substantially stronger with these two factors than behavioral paradigms did. In addition, the latter only correlated weakly between each other and turned out to have a low test-retest reliability over the course of three months.

**Evaluation der Fahrer-Fahrzeug-Interaktion im Kontext automatisierter Sicherheitssysteme**

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CANCELED

Im Beitrag wird eine Studie vorgestellt, in der die Reaktion des Fahrers auf einen automatischen Lenkeingriff eines Sicherheitssystems zur Abschwächung von Kollisionsfolgen untersucht wurde. Ziel der Studie war es, herauszufinden, ob der Fahrer den Lenkeingriff ungewollt durch Festhalten des Lenkrades beeinträchtigt und somit die Effektivität des Systems schwächt und ob diese Reaktion durch Instruktion beeinflusst werden kann. Hierzu wurden insgesamt 40 Teilnehmer in einer Folge von drei Fahrten im Fahrsimulator Kollisionssituationen mit und ohne Systemeingriff ausgesetzt. Erhobene Daten waren das Lenk- und Bremsverhalten gemeinsam mit subjektiven Daten. Die Ergebnisse zeigen, dass die meisten Fahrer während der ersten Interaktion mit dem System das Lenkrad blockierten, indem sie es festhielten. Interessanterweise konnten die meisten Personen den Eingriff des Systems nach der Situation nicht erinnern. Wurden die Probanden in einer wiederholten Fahrt vor dem Systemeingriff per Instruktion dazu motiviert das Lenkrad locker zu halten, wurde das Lenkrad während des Systemeingriffs deutlich weniger blockiert und damit der Eingriff nicht abgeschwächt. Die Studie legt nahe, dass ein ungewolltes Beeinträchtigen eines automatischen Lenkeingriffs aufgrund einer anzunehmenden unbewussten Schreckreaktion des Fahrers durch eine entsprechende Vorinformation oder Warnung verhindert werden könnte.

## **RKWard: A cross-platform graphical user interface and development environment for R**

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Teachers looking for a statistics program suitable to their student's training will often feel forced to resort to tools that initially allow for a friendly introduction to statistical methods, but are too limited to accompany students in later phases of their academic careers. Other tools -- such as the R language -- are highly versatile, but confront new users with a steep learning curve. The free software RKWard, a cross-platform graphical user interface to R, lowers this entry barrier by providing intuitive graphical dialogs for common tasks, from importing and editing to analysing and visualizing data. It transparently translates these actions into R commands, making it easy to get started, and later move on from its graphical dialogs to actual R programming. The HTML-based output format helps logging relevant steps of an analysis, and to repeat and adjust prior steps comfortably. Professional researchers benefit from the provided R code recipes, as well as RKWard's powerful tools for both interactive use of R and advanced programming. Statistics teachers value the fact that RKWard's existing graphical dialogs can easily be enhanced and new functionality added, specific to their curriculum.

## **Stimulus-Response-Binding In Decision Making Under Uncertainty**

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According to distractor-based response retrieval (Frings, Rothermund, & Wentura, 2007), irrelevant information will be integrated with the response to the relevant stimuli and further, the immediate repetition of irrelevant information can retrieve the previously executed response thereby influencing responding to the current target (leading either to benefits or costs if the retrieved response is compatible or incompatible, respectively, to the currently demanded response). We analyzed whether this effect also holds for decisions rather than simple motoric reactions. The hypothesis was tested in four experiments in which participants had to decide as fast as possible which disease an imagined patient suffered from. The decisions were based on two cues; one did not give any hint for a disease (the irrelevant cue), whereas the other did (the relevant cue). We found a significant influence of repeating the irrelevant cue on decision behavior. That is, participants tended to repeat their decision if the irrelevant cue was repeated in the following decision situation. Thus, stimulus-response binding which typically is discussed in basic processes of perception and action has also implications for arguably more deliberative cognitive processes in decision making under uncertainty.

## **The effects of process and outcome accountability on creative performance**

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Accountability—the expectation to justify one’s actions or decisions—has been found to affect judgemental and investment decisions. The direction of this effect is influenced by the type of accountability. Whereas process accountability seems to enhance decision quality, outcome accountability has often detrimental effects. We aimed at showing this effect for creativity tasks. Process and outcome accountability were manipulated orthogonally by announcing an interview in which the participants (N = 146) either had to justify their work process, their outcome, both or no interview was announced (non-accountable control group). Participants were then asked to generate new ideas for alarm clocks. As dependent variables the quality (i.e., uniqueness) and quantity of the ideas, time spend on the task and self-reported mental strain were assessed. Accountability led to fewer unique ideas and higher self-reported strain. The effect of accountability on uniqueness of ideas was mediated by strain. Moreover, outcome accountability reduced the number of ideas overall. Process accountable participants were less efficient in generating ideas as indicated by a longer time spend working on the task (without producing more ideas). Our findings are in stark contrast to previous studies and suggest that in creativity tasks both types of accountability have negative effects.

## **How sequential changes in reward magnitude modulate cognitive flexibility:**

### **Evidence from voluntary task switching**

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There is much evidence that the prospect of reward modulates cognitive control in terms of more stable behavior. Increases in expected reward magnitude, however, have been suggested to increase flexible behavior as evidenced by reduced switch costs. In a series of three experiments, we will provide first evidence that this increased cognitive flexibility following increases in reward magnitude also promotes deliberate task switching. A modified task switching paradigm with forced- and free-choice trials and varying reward prospects was used. In Experiments 1 and 2, the prospect of a reward increase as compared to unchanged high reward increased voluntary switching rate (VSR). Experiment 3 showed that the prospect of a reward decrease did not alter VSR. The findings are strong evidence for a mechanism that biases the cognitive system either towards stability or flexibility depending on changing reward expectation. These results will be discussed within the framework of the adaptive gain theory.

## Speaker separation and foreground–background selection in ambiguous listening situations

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Disentangling two or more speakers in a complex auditory scene (e.g., in a busy cafeteria) poses a challenge to every listener. According to recent theories, the auditory system accomplishes this task by switching back and forth between different interpretations of the auditory input (perceptual multistability). Empirical evidence for this view has mainly been obtained with pure tone sequences. We aim to extend this work towards more natural stimulus material by developing a set of syllables that can be combined to create ambiguous listening conditions. In a behavioural experiment, we checked whether our new stimulation is able to evoke multistable perception, i.e. perception changing over time without actual stimulus changes. Participants were presented with continuously repeating six-syllable cycles (interleaved consonant–vowel syllables, uttered alternately by two human speakers). Participants indicated via button presses whether they perceived the two speech streams as an inseparable mixture of both speakers or as two separate streams. In the latter case, they also distinguished which speaker was in the attentional foreground. The majority of participants perceived the syllable series as multistable. These results support recent models of auditory perception and provide a suitable stimulus set for further testing these models under ecologically valid listening conditions.

## Expectation Mismatch: Differences Between Self–Generated and Cue–Induced Expectations

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Expectation of upcoming stimuli and tasks can lead to improved performance, if the anticipated situation occurs, while expectation mismatch can lead to less efficient processing. Researchers have used methodological approaches that rely on either self–generated expectations (predictions) or cue–induced expectations to investigate expectation mismatch effects. Differentiating these two types of expectations for different contents of expectation such as stimuli, responses, task sets and conflict level, we report experiments suggesting that self–generated expectations lead to larger facilitating effects and conflict effects on the behavioral and neural level – as compared to cue–based expectations. On a methodological level, we suggest that self–generated as compared to cue–induced expectations allow for a higher amount of experimental control in many experimental designs on expectation effects. On a theoretical level, we argue for qualitative differences in how cues vs. self–generated expectations influence performance. While self–generated expectations might generally involve representing the expected event in the focus of attention in working memory, cues might only lead to such representations under supportive circumstances (i.e., cue of high validity and attended).

## **Evaluative conditioning is sensitive to experimentally induced forgetting**

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Evaluative conditioning (EC) is a change in the valence of a stimulus (CS) that is due to pairings with a valent stimulus (US). A factor intensely discussed in EC research is the impact of contingency awareness/memory and its relation to associative and propositional models of EC. In most studies, memory is measured at the end of the experiment, which makes it unclear whether a memory influence is due to differences in learning or due to differences in the way memory is represented at the time of testing. In order to understand the role of the memory representation, it is useful to experimentally induce forgetting. In two experiments, CS-US pairings were presented to the participants. Afterwards, contingency memory was disrupted selectively for some of the pairings with a retroactive interference manipulation for which participants had to memorize new pairings of the CSs. This manipulation clearly reduced the magnitude of EC. The results and their implications are discussed from the background of a memory-and-retrieval model of EC.

## **The Influence of visual and auditory alerting on evacuation behavior in road tunnel fires**

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Analysis of real fire scenarios in road tunnels and studies in virtual reality show problematic user behavior during tunnel fires. Many tunnel occupants are leaving the tunnel too late or not at all. Visual and auditory alerting may have an important influence on the user behavior in such situations. The present study tested the influence of two types of alerting on user behavior compared with a situation without alerting. 54 participants experienced a fire in a virtual reality road tunnel. In the control group, participants experienced no alerting, the visual alerting group only experienced a visual alerting and the visual and auditory alerting group experienced a combination of visual and auditory alerting (each group  $n = 18$ ). Data was collected using a five sided CAVE system. Participants with a combination of auditory and visual alerting were using the emergency exit more often than in the other two groups, but needed more time to leave their car. Visual alerting alone had no influence on the behavior compared to the control group. The results underline the importance of comprehensible voice messages in road tunnels and contribute to a better understanding of evacuation in tunnel fire emergencies.

### **Disabling conditions in reasoning with quantifiers**

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When reasoning with conditional “If A, then B” rules, people often refuse to derive logically valid conclusions if they are aware of situations (i.e., disabling conditions) that prevent the then-part of the conditional to occur although the if-part is true. The more disabling conditions people can think of, the more likely they reject the conclusion. However, conditionals are not the only logical constants. In this study we tested whether disabling conditions also affect reasoning with quantifiers, and whether their effect depends on the kind of quantifier (universal vs. existential quantifiers). In our experiment we rephrased conditionals from the existing literature as either universal (“All apples that are ripe will fall from the tree”) or existential (“There is at least one apple that is ripe and will fall from the tree”) statements and embedded them into reasoning tasks with the structure of Modus Ponens and Modus Tollens inferences. Participants had to rate their acceptance of the conclusion. Results show that the amount of disabling conditions also affects reasoning with quantifiers, but that the kind of quantifier (universal vs. existential) does not affect the evaluation of conclusions. Implications for the relevance of classical logic in human everyday reasoning are discussed.

### **Audio-visual synchrony increases the saliency of visual direction changes: Pip-and-pop effect revisited**

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Spatially uninformative tones typically enhance detection performance of stimuli with a synchronous visual transient. Such findings can be interpreted in terms of an increased saliency due to audio-visual integration or in terms of a change in the visual search process due to altered fixation behavior. In order to distinguish between these alternatives, we evaluated search performance as well as probe discrimination performance in displays that involved up to four moving objects. All objects randomly changed their direction of motion once within intervals of up to 1.15 s. An uninformative tone was either synchronous with the direction changes of one of the objects or unrelated to any direction change. We observed an inefficient visual search for objects that change their motion direction simultaneously to the tone (i.e., no pop-out; 2:1 ratio between target-absent and target-present trials). However, search performance could be predicted from performance in an unrelated useful field of view task (i.e., a perceptual task). Furthermore, probe discrimination performance indicated that attentional capture following audio-visual direction changes was more pronounced than following visual direction changes. Therefore, we conclude that synchronous auditory and visual transients indeed enhance the saliency of stimuli due to audio-visual integration on a perceptual level.

**Names, Frames, Economic Games. A meta-analysis on semantic priming  
and framing effects across popular game studies**

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Experimental economists regularly dismiss the instructions of their laboratory studies (economic games) as mere explanations of the payoff schemes. At the same time, they are remarkably consistent in removing all words from the instructions that bear meaningful links to situations beyond the experimental realm. Yet outside the laboratory, interactions rarely occur in such a unilateral and abstract fashion. The external validity of economic games is therefore questionable. We conducted a meta-analysis on whether the wording of the instructions affect game play in four of the most popular economic game types: Public Goods Games, Prisoner's Dilemmas, Trust Games, and Dictator Games. Results indicate the wording has medium to strong effects on game play. These effects call into question the most common explanation for game play—social preference theories—and suggest that an approach integrating cognitive theories is required.

**Investigating the Effects of Informational versus Normative Social Influence  
on Perceptual Decision-Making Using the Diffusion Decision Model**

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Classic studies on social influence (Sherif, 1935; Asch, 1956; Moscovici & Personnaz, 1980) employed simple perceptual decision-making tasks to examine how the opinions of others change individuals' judgments. Since then, one of the most fundamental questions in social psychology has been whether social influence can alter basic perceptual processes. To address this issue, we used a diffusion model analysis (Ratcliff, 1978). Diffusion models provide a stochastic approach for separating the cognitive processes underlying speeded binary decisions. Following this approach, we first aimed at disentangling whether social influence on decision-making is due to altering the uptake of available sensory information (i.e., a perceptual bias) and/or due to shifting the decision criteria (i.e. a judgmental bias). Second, we aimed to analyze the differential effects of informational and normative social influence. Three experiments consistently revealed that social influence can alter the uptake of available sensory evidence. By contrast, participants did not adjust their decision criteria. These results replicated our earlier findings (Germar, Schlemmer, Krug, Voss & Mojzisch, 2014). Additionally, we found that informational influence was sufficient to induce the perceptual bias. Besides increasing this effect, normative influence didn't seem to differently alter perceptual decision-making. Especially, this result will be discussed by critically examining the task structure and the manipulation of normative influence.

**Neurophysiological correlates of attention and speech perception  
in a dynamic “cocktail-party” situation in younger and older adults**

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Speech understanding in complex listening environments requires auditory scene analysis, comprising auditory object formation and segregation, and allocation of the attentional focus to the speaker of interest. Changes in the auditory scenario, e.g., in speaker settings in a multi-talker environment, require re-focusing of attention. Here, we tested whether changes in speaker settings are more disturbing for older than for younger adults, employing a simulated multi-talker scenario and electroencephalography. Sequences of short words (combinations of brief company names and stock-price values) were simultaneously presented by four speakers at different locations in space. The participants had to respond to the price of a target company, while ignoring all other companies. Target speaker voice and position were kept constant for a number of trials and then the speaker voice or position or both were changed. In both age groups, all types of changes led to significantly higher error rates relative to the pre-change level. Younger adults showed pronounced N2 and N400 components, suggesting effective inhibition of concurrent speech stimuli. In contrast, older adults exhibited a stronger N1 component, suggesting increased early allocation of attentional resources. After the changes both age groups recovered similarly in behaviour, while the electro-physiological measures indicated different underlying mechanisms.

**Focusing attention on cooperation: An Eye-tracking analysis of social preferences**

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Numerous studies examined behavior in social dilemmas. However, little is known about cognitive processes underlying social preferences. The present study investigates the influence of gaze behavior on choices involving other-regarding preferences. Past studies in the field of consumer research found that the duration a choice option is fixated influences subsequent decision behavior. These results indicate that choices involving social preferences might also be influenced by gaze duration. Here, we develop a study to attention to particular choice options in a simple symmetric Prisoners Dilemmas (PD). Using 2 different manipulations attracting attention to a certain spatial location in a predecessor task ((a) categorization task and (b) memory task) we increased attention either to the cooperative or defective choice in the PD. We report gaze behavior and participants' subsequent choices in the PD, finding that participants indeed look at previously activated spatial locations more and tend to choose the alternative presented in the particular location. Implications regarding cooperative behavior and its underlying processes are discussed.

## Some challenges to the traditional view of feedback-related negativity (FRN)

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In a pseudo rule-learning task, 27 participants responded with left or right button presses to colored digits or letters, to detect the rule that allegedly governed positive and negative feedback. However, feedback was presented randomly. In the blocked condition (BC), the same two feedback words were used for positive and negative feedback across each 40-trials sub-block. In the random condition (RC), feedback words were randomly drawn from sets of positive and negative words, thus preventing the development of percept-meaning associations. Medial fronto-central FRN (290–340 ms) was restricted to BC and completely absent in RC. Moreover, while ERPs in the FRN time range were identical for negative feedbacks in BC and RC, ERPs for positive feedback were more positive in BC than RC. Finally, the increase-over-trials of FRN within the sub-blocks of BC, reflecting the development of percept-meaning associations, was due to increasing positivity for positive feedback, whereas ERPs for negative feedback did not change across trials. Results show that FRN 1) actually reflects a positivity specific to positive feedback, rather than a negativity specific to negative feedback, and 2) requires a distinct association between a perceptual entity and the positive feedback category.

## Gedächtnisverzerrungen als Grund für schlechte Gruppenentscheidungen?

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Bei Entscheidungen, die von Gruppen getroffen werden, schaffen es Gruppenmitglieder oft auch dann nicht, ihre zuvor individuell getroffene Entscheidung zu revidieren, wenn diese unter Berücksichtigung der Gesamtheit aller zur Verfügung stehenden Informationen falsch ist. Bisherige Studien konnten eine Reihe von Ursachen für dieses Phänomen identifizieren, darunter Verzerrungen des Diskussionsinhalts sowie in der individuellen Informationsbewertung der Gruppenmitglieder. Die vorliegende Studie untersucht eine weitere Verzerrung der individuellen Informationsverarbeitung, welche möglicherweise die Revision suboptimaler Gruppenentscheidungen verhindert: eine verzerrte Erinnerungsleistung. Spezifisch wird angenommen, dass Informationen, die den Gruppenmitgliedern bereits vor der Diskussion zur Verfügung stehen besser erinnert werden als in der Diskussion neu gelernte Informationen. Darüber hinaus wird ein Gedächtnisvorteil von Informationen, die der Präferenz der Gruppenmitglieder entsprechen gegenüber präferenzinkonsistenten Informationen angenommen. Diese Gedächtnisverzerrungen wurden in einer Serie von drei Experimenten anhand einer Personalentscheidungsaufgabe untersucht, wobei graduell mehr Elemente einer realen Gruppendiskussion in das Design integriert wurden. Die Studien liefern konsistente Belege für eine Erinnerungsverzerrung zugunsten initialer gegenüber neuen Informationen sowie Hinweise auf einen Vorteil konsistenter gegenüber inkonsistenten Informationen, welcher jedoch deutlich schwächer ist. Auf Grund einer sehr geringen Varianz in der Entscheidungsqualität konnte noch kein Zusammenhang zwischen den Biases und der Entscheidungsqualität etabliert werden.

## Die Auswirkung von Ostrazismus und sozialem Ausschluss auf epistemische Bedürfnisse

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Ostrazismus und sozialer Ausschluss führen zur Verletzung relationaler Bedürfnisse. Bislang ist unklar, inwiefern auch epistemische Bedürfnisse der ausgegrenzten Individuen beeinflusst werden. Epistemische Bedürfnisse beziehen sich auf den Wunsch die Welt zu verstehen und zu erkennen, was real ist. Da die Gründe für den Ausschluss den Opfern häufig nicht mitgeteilt werden, sollte dies zu erhöhter epistemischer Unsicherheit bezüglich der Ausgrenzungserfahrung führen. Tatsächlich konnte mittels Selbstbericht bestätigt werden, dass exkludierte Versuchspersonen weniger verstehen, warum sie auf diese Art behandelt wurden, als inkludierte Versuchspersonen und dass sie ein größeres Bedürfnis haben, die Ausgrenzer nach den Gründen ihres Verhaltens zu fragen. Darüber hinaus wird erwartet, dass auch ein generelles epistemisches Bedürfnis, welches sich nicht direkt auf die spezifische Ausgrenzungssituation bezieht, verstärkt wird. Es existiert ein epistemisch-sozialer Nexus, wodurch Gruppen und Personen Individuen dabei helfen zu erkennen, was real ist. Durch Ausschluss und Ostrazismus verlieren Individuen diese epistemischen Lieferanten, was zu einem erhöhten, generellen epistemischen Bedürfnis führen sollte. Ziel des gegenwärtigen Projekts ist es, den Effekt von Ausgrenzung und Ausschluss auf diese spezifischen und generellen epistemischen Bedürfnisse zu untersuchen.

### **It's automatic, isn't it: Are stimulus-response binding and retrieval effects immune to manipulations of S-R contingencies?**

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Stimuli and simultaneously executed responses are integrated into a transient episodic structure (an S-R binding or event file); repeating the stimulus triggers retrieval of the associated response. Existing studies on S-R binding and retrieval processes typically assume that these processes occur in automatic fashion. The present experiment put this claim to close scrutiny by manipulating S-R contingencies blockwise in a sequential priming paradigm. Stimulus repetitions were either predictive of response repetitions (positive contingency) or response changes (negative contingency) or orthogonal to the response relation (no contingency). Results revealed that compared to the orthogonal condition, S-R binding and retrieval effects were boosted under positive contingency but were reduced under negative contingency, although participants were unaware of the contingency manipulation. These findings implicate that S-R binding and retrieval processes may be implicitly tuned to adapt to contextual manipulations that either promote or hinder the use of S-R bindings for automatic action regulation.

## **Sounds with time-to-contact properties are processed preferentially**

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Sounds with rising intensities are known to be more salient than their constant amplitude counterparts [Seifritz et al., 2002]. Incorporating a time-to-contact characteristic into the rising profile can further increase their perceived saliency [Gray, 2011]. We investigated whether looming sounds with this time-to-contact profile might be especially effective as warning signals. Nine volunteers performed a primary steering task whilst occasionally discriminating oriented Gabor patches that were presented in their visual periphery. These visual stimuli could be preceded by an auditory warning cue, 1 second before they appeared. The 2000 Hz tone could have an intensity profile that was either constant (65 dB), linearly rising (60 – 75 dB, ramped tone), or exponentially increasing (looming tone). Overall, warning cues resulted in significantly faster and more sensitive detections of the visual targets. More importantly, we found that EEG potentials to the looming tone were significantly earlier and sustained for longer, compared to both the constant and ramped tones. This suggests that looming sounds are processed preferentially because of time-to-contact cues rather than rising intensity alone.

## **What is Adaptive about Adaptive Decision Making? A Parallel Constraint Satisfaction Account**

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There is broad consensus that human cognition is adaptive. However, the vital question of how exactly this adaptivity is achieved has remained largely open. We contrast two frameworks which account for adaptive decision making, namely broad and general single-mechanism accounts versus multiple-strategy accounts. We contrast a single-mechanism model for decision making based on parallel constraint satisfaction (PCS-DM) theoretically and empirically against a multi-strategy accounts. Results show that manipulating the environmental structure produces clear adaptive shifts in choice patterns, as both frameworks would predict. However, results on the process level, in information search and from cross-prediction corroborate single-mechanism accounts in general and PCS-DM in particular.

## Using cognitive modeling to efficiently analyze trial-by-trial variability in neuroimaging data: the case of memory-based decisions

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Event-related designs for functional magnetic resonance imaging (fMRI) provide us with neuroimaging data that is specified on a trial-by-trial level. On the other hand, cognitive models estimate parameters that might vary between subjects but are assumed to be constant throughout conditions or entire experiments, while trial-by-trial variability in performance is attributed to random noise. At least to some extent, however, these fluctuations might be related to systematic variability in the state of the neurocognitive system and hence to variability in model parameters. Fluctuating performance thus becomes an indicator of trial-by-trial deviations from "averaged" parameter estimates. To optimally capture such deviations, Bayes' rule can be applied for obtaining trial-specific posterior parameter estimates. Ultimately, these estimates are used to inform the analysis of fMRI data to identify brain regions that show similar patterns of variability. I will illustrate the application of this approach using behavioral and fMRI data from a memory-based choice task: here, the choice model estimates memory-related parameters and trial-by-trial variability in these estimates is linked to fMRI signals in the hippocampus.

## Spontaneously spotting and applying shortcuts in primary school arithmetic

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Flexible use of task-appropriate solving strategies is an important goal in mathematical education. Investigating how students can be supported in spotting and applying shortcut strategies flexibly we present contextual factors that influence the spontaneous usage of shortcuts, as well as the transfer between them. During mathematical development and with increasing expertise the understanding of the concept improves and can lead to improvements in strategy use (procedural knowledge) and vice versa, so that these two forms of knowledge increasingly integrate with each other. Successfully spotting and applying a shortcut might thus benefit from factors activating conceptual and/or procedural knowledge. Firstly, we investigated that children search for shortcuts based on commutativity ( $a + b = b + a$ ) spontaneously. Additionally we found that the use of two different shortcuts is associated, if the two shortcuts are based on the same principle. The link via the concept helped younger children to use diverse shortcuts spontaneously. Secondly, we tested why commutativity-based shortcuts in arithmetic might be used more frequently if children have worked on an estimation task before. A wealth of research shows that estimation is supportive for flexibility and transfer. This research did not consider superficial forms of transfer. For instance, long-range eyemovements induced by an estimation task rather than estimation per se might provoke flexibility in arithmetic problems. Investigating eyemovements we tested this account and found that changed fixation patterns did not lead to higher shortcut use. Overall, we show that spontaneous strategy use can be supported by some contextual factors and impeded by others.

## **Is conflict the root of all evil?**

### **An approach to clarify the effect of conflict priming on target valence**

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Can conflict priming be used to induce a negative valence of an otherwise neutral target? Recent studies found evidence for such an influence. For example, a neutral target was judged as more negative if preceded by a conflicting Stroop prime (Fritz & Dreisbach, 2013). In a first experiment, we replicated this finding. Participants were primed with conflicting or non-conflicting Stroop stimuli and had to judge the valence of a neutral pictograph presented after the Stroop prime. We found evidence for a more negative evaluation of the neutral stimuli after conflict as compared to non-conflict. In a subsequent experiment, our participants classified the Stroop stimulus (as congruent versus incongruent) and immediately afterwards judged the neutral stimulus. Although we found a typical Stroop effect in the RTs, we found no influence of the Stroop congruence on the evaluation of neutral stimuli. In subsequent experiments, we clarified whether possible confounds in earlier studies, such as the frequency of the respective sensory signals, are capable of explaining the valence effects that were hitherto attributed to conflict priming.

## **Free choice at first sight – The role of spatial vs. non-spatial response codes in voluntary saccade control**

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Models of saccade programming usually distinguish between stimulus-driven and goal-driven selection, the latter being influenced by anticipation of saccade target identity (Huestegge & Kreutzfeldt, 2012). While goal-driven selection conditions are typically implemented via explicit goal instruction (i.e., participants are forced to weight attention), we here present a novel paradigm involving free target choice (in the absence of any valence gradients). Specifically, we asked to what extent free target choice is based on features related to (non-spatial) target identity (here: object color), or rather on spatial characteristics (here: target direction). Participants were instructed to execute a saccade to one of four peripheral targets in three different choice conditions: free choice (unconstrained), constrained choice based on target color, constrained choice based on spatial target direction. A Bayesian analysis of choice frequencies revealed that free choice behavior closely resembled constrained choice behavior based on spatial constraints. These results suggest that free saccade target choice is mainly guided by spatial characteristics. We assume that subjects tend to avoid a less parsimonious recoding of object identity codes (e.g., "green object") into spatial codes, the latter being a necessary prerequisite to configure saccade commands.

## Bottom-up Priming of Attentional Control by Onsets of Stimuli?

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The extent of attentional control can be regulated according to certain contextual demands. For example, contexts associated with high conflict frequency (e.g., 80% conflict trials presented at location above) involve stronger attentional control than contexts with low conflict frequency (e.g., 20% conflict trials presented at location below). The corresponding control set can be activated in a bottom-up manner when stimuli are presented at the specific context. Here we ask whether low level visual attention features are sufficient in activating the context-specific attentional control set. For example, the mere onset of a stimulus might disambiguate the relevant location context and thus, might serve as low level mechanism that activates the context-specific control setting. Therefore, task-relevant target stimuli and task-irrelevant dummy stimuli were presented, so that the onsets of stimuli at both contexts should compete for triggering the appropriate control setting. Results of three experiments with varied onset-intensity showed, that the mere onset of either stimulus is not sufficient to prime the context-associated attentional control set. Instead, the attentional control set becomes activated only after stimulus identification.

## Effects of non-invasive brain stimulation on arithmetic learning

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Arithmetic skill acquisition is an essential step in the development of mathematical competencies. Neuroimaging studies have revealed that this long-term learning process is associated with neural activity in the left posterior parietal cortex (PPC). It is unclear, however, whether this brain region is causally related to arithmetic learning and whether the learning success can be modulated by means of non-invasive brain stimulation. We addressed these questions by applying transcranial direct current stimulation (tDCS) over the left PPC during a 45-min arithmetic fact training and a follow-up test session 24 hours later. Sixty participants received either anodal, cathodal, or sham tDCS while practicing complex multiplication and subtraction problems. Results revealed that cathodal tDCS (compared to sham) decreased learning rates during training and resulted in poorer performance even 24 hours after stimulation. Anodal tDCS improved learning rates specifically for subtraction problems. These findings show that the left PPC is causally involved in arithmetic learning and that even a single-session tDCS application can modulate the success of arithmetic knowledge acquisition. In addition, our findings suggest that the enhancing effect of anodal tDCS can have a high specificity and only affect subprocesses of arithmetic learning.

## **Colors make the man... and get you the job!**

### **Halo effects in job application as a function of shirt color and the Big Two**

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Halo effects are one of the most well-known types of judgment biases. One still unresolved issue is the question whether different personality dimensions, such as agency and communion, promote halo effects of different strengths depending on the context. Since communion attributes are especially important in social jobs, they should lead to stronger halo effects than agency attributes in this context. The same should apply for warm compared to cold colors because warm colors are usually associated with communion traits, whereas cold colors are associated with agency traits. Accordingly, these effects should be weaker in the context of technical jobs. To test these hypotheses, participants judged fictitious individuals applying for social and technical jobs in three experiments. These applicants were described with different behaviors and wore either blue or red shirts. The results showed that technical jobs are more likely to be given to applicants with agency behaviors and blue shirt colors, whereas social jobs are rather given to applicants with communion behaviors and red shirt colors. However, the effect of colors wasn't limited to the respective personality dimensions, but rather had an impact on all judgments. These findings have important implications for the understanding of halo effects in job-related contexts.

## **Motor workspace and intermanual transfer**

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The present study examines the impact of motor workspace on amplitude perception in an intermanual replication task. We set up a motor replication task in which participants performed movements on a covered digitizer tablet while different gains perturbed the relation between hand and cursor movement (phase 1). The task required an intra-modal (intermodal) replication of the initially performed (seen) hand (cursor) movement in a subsequent motor replication phase without visual feedback (phase 2). In phase 1, participants controlled the stylus with their dominant hand, and performed the manual action on the right side of the tablet (right workspace). In phase 2, they performed the motor replication with their non-dominant hand on the left side of the tablet (left workspace). The order of workspace was controlled. Focusing on which information had to be recalled, intra-modal replications in the left workspace were less accurate (in terms of stronger aftereffects) than in the right workspace. This difference was not found for intermodal replications. Surprisingly and in contrast to unimanual replications, we found stronger aftereffects for intra- than for intermodal replications in the left workspace, but no difference in the right workspace. We assume that the amount of feature overlap accounts for these effects.

## **Effects of emotional meaning in language processing:**

### **Evidence from event-related brain potentials in cross-modal comparison**

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Language is comprised of two domains: speech and writing. While plenty of studies investigated the influence of emotional meaning on the different stages of written word processing, such evidence is scarce for spoken words, even though spoken language may play a more important role in human communication. In the present study, we compared the processing of emotional words in two modalities by means of event-related brain potentials (ERPs). Participants were presented with identical words that were either written or spoken by a human voice (Exp 1) or a computer-generated voice (Exp 2). For written words, emotion effects were evident in ERP components previously shown to be modulated by emotional content: the early posterior negativity (EPN) and the late positive complex (LPC). For spoken words, late emotion-related ERP effects (N400, LPC) occurred with similar latencies and scalp topographies in both experiments, indicating sustained elaborate processing at late processing stages. Interestingly, early effects of emotion on the P200 and the EPN component were restricted to words spoken by the human voice (Exp. 1). Since the P200 is known to reflect processing of emotional prosody we suggest that this early effect was caused by subtle, meaning-consistent prosodic information.

## **Height simulation in a virtual reality CAVE system: Effects of presence on fear responses**

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Acrophobia is characterized by intense fear in height situations. Virtual reality (VR) can be used to trigger such phobic fear by exposing fearful persons to phobia related stimuli and environments and to successfully treat such phobias in VR exposure therapy (VRET). Since the mechanisms of VRET in phobias are not yet fully understood, it is important to further elucidate factors that modulate and mediate the VR triggered fear. The present study sought to investigate the relationship between presence, the feeling to be present in the virtual environment, and acrophobia related anxiety and behavior. The study was conducted in a 5-sided CAVE. Associations between fear responses, behavior, and presence in the VR were examined, as well as effects of wind simulation realized by multiple fans. This study revealed a high external validity for a virtual reality CAVE environment in provoking height related fear responses. Importantly, presence was found to be an important moderator of fear responses. Simulation of wind increased the experienced realism of the virtual height environment. We suggest that CAVE systems may be used to improve VRET by enhancing emotional responses triggered by the VR and thus improving treatment efficacy and transfer to real situations.

## **Generalization of Recognition Memory Models across YES/NO and Two-Alternative Forced-Choice Tasks Using Ternary Response Options**

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A substantive part of research concerned with recognition memory has been dedicated to the investigation of different measurement models' adequacy. There are models based on signal detection theory (SDT; Green & Swets, 1966) that assume continuous underlying memory processes such as the popular unequal-variance signal detection (UVSD) model, whereas others build on the notion of discrete latent states, the most prominent being the two-high-threshold model (2HTM; Snodgrass & Corwin, 1988). However, unless parameter restrictions that appear to be problematic are introduced (Verde, Macmillan, & Rotello, 2006), model parameters are not fully identified for a single set of hits and false alarms. One way to obtain fully identified model parameters is to introduce a third response option ("UNSURE" or "SKIP"; Singmann, Kellen, & Klauer, 2013). The current study aimed to generalize the 2HTM as well as the UVSD across the YES/NO and the two-alternative forced-choice (2AFC) task using a response scale with added option "UNSURE". A memory strength manipulation, different stimulus types, and NEW-NEW2AFC trials (Province & Rouder, 2012) were incorporated. This study provides evidence that the UVSD as well as the 2HTM can be adequately generalized across these tasks with both models performing nearly equally well.

## **Effects of Mood on Hindsight Bias**

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Hindsight bias is the overestimation of one's prior knowledge of facts once these facts become known. It is as yet unknown how affective states influence hindsight bias and its underlying processes. Dual-mode models of adaptive functioning (e.g., Fiedler & Bless, 2006) suggest that negative mood promotes accommodative information processing, whereas positive mood promotes assimilative processing. We investigated mood effects in a standard hindsight-bias memory task. Participants (n = 115) were randomly assigned to an induced negative or to a neutral mood condition and provided and recalled 60 judgments to difficult general-knowledge questions. During recall, they received the correct responses for experimental items, but not for control items. Both groups showed hindsight bias. Multinomial model-based analyses revealed group differences in the underlying cognitive processes. Participants in neutral mood showed recollection bias, that is, they recalled their judgments for control items with higher probability than their judgments for experimental items. Participants in negative mood showed no recollection bias. Both groups showed equal reconstruction bias, that is, their reconstruction of their prior judgments in cases of unsuccessful recollection was biased by the correct response. Results support the assumption of an accommodation-type processing under negative mood.

## **An evaluation of Franz Marc's colour theory using implicit testing procedures**

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In the early 20th century, the German expressionist painter Franz Marc formulated a colour theory based on his personal sensations. He characterised the „cool“ blue as the „male principle“. Yellow represented the „female principle“, which he declared as „gentle, cheerful and sensual“. This leaves red, the colour he perceived as „brutal and heavy“. We tested the colour–meaning associations assumed by Marc via implicit measures, using Single Category Implicit Association Tests. The participants had to classify word and colour stimuli as belonging to one of two meaning categories (e.g., 'male' or 'female') by pressing one of two response buttons. One of the meaning categories was paired with a colour (e.g., male – blue). Response times should be faster when related concepts (e.g., male – blue or gentle – yellow) share the same response button, compared to when unrelated concepts are assigned to the same button (e.g., male – yellow or gentle – red). The pattern of response times was compatible with the associations of blue–male, yellow–female, blue–cool, and yellow–gentle proposed by Marc. In addition, the data indicated associations of yellow–warm and red–warm, which were not explicitly formulated by Franz Marc. However, our results did not confirm the proposed red–brutal association.

## **Visuomotor priming of power and precision grips**

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Priming of visually guided grasping is still subject to debate. Discrepancies in the data might be related to inconsistencies in the experimental tasks, procedures, and designs. The present set of experiments takes a systematic approach at disentangling under which circumstances visuomotor priming occurs. Participants responded to a target stimulus that required deciding between a precision and a power grip. Target stimuli were preceded by primes consisting of photographs of objects that could be manipulated with a power grasp (large object), a precision grasp (small object), with either grasp (ambiguous object), or a blank screen (no prime). Participants responded via button presses or by grasping a real object with the respective grip. In addition, we manipulated the availability of visual feedback. Under real grasp conditions, response times tended to be faster for congruent prime–target pairs (e.g., prime = small object, target = precision grip) compared to incongruent prime–target pairs. In contrast, no such congruency effects were observed when participants responded via button presses. Furthermore, no prime trials entailed the longest response times, but only if actual grasping was required. Implication of the results for the understanding of the planning and execution of grasping actions are discussed.

## **Neurophysiology of the concurrent costs of manual actions on working memory processes**

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This study investigates the neurophysiology of the concurrent costs of manual action execution on working memory (WM) processes (encoding, maintenance, retrieval) considering visuo-spatial and verbal domains of WM. Event related potentials (ERPs) provide a precise method for investigating which WM processes are affected by manual action execution. Thirty participants will be tested in a 2 (single vs. dual task) x 2 (visuo-spatial vs. verbal WM) within subject design. The baseline single-task condition requires performing only a WM task. The dual-task condition requires performing a WM task and a grasp-to-place task simultaneously. Preliminary analysis of the behavioral data showed, as expected, a main effect of the task ( $F(1, 11) = 34.60$ ,  $p = .001$ ) indicating lower WM performances in the dual task and an interaction between the task and WM domain ( $F(1, 11) = 23.24$ ,  $p = .001$ ). Memory performance decreases more in visuo-spatial WM for the dual task. Preliminary results indicate that manual action execution interferes with WM in a domain specific manner. More sensitive ERPs analyses will help to relate the concurrent costs to particular WM processes, by examining, e.g., anterior negativities in the ERPs.

## **Human judgements vs. Latent Semantic Analysis as measures for word similarities**

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Distributional Semantics Models such as Latent Semantic Analysis (LSA) allow for the automatic computing of word similarities. These similarities are based on co-occurrence patterns of words in a large text corpus. We conducted two lexical priming experiments employing a Lexical Decision Task to examine the role of LSA similarities and human similarity judgements in predicting priming effects. These human judgements were obtained with an online rating questionnaire. In the first experiment, prime-target pairs were selected that covered a wide range of LSA similarities between primes and targets. Both human similarity judgements as well as LSA similarity ratings were significantly correlated with response times towards the target. Moreover, they were substantially correlated to each other ( $r = .56$ ). In the second experiment, we explicitly separated the two similarity measures and employed a 2x2 design with human similarity judgement (highly similar vs. not similar) and LSA similarity (highly similar vs. not similar) as independent variables. In this experiment, only the human judgements had a significant effect on response times. These results suggest two interpretations: Either human judgements are a superior variable in predicting priming effects compared to LSA similarities, or they are so similar that separating them yields misleading results.

## Comparing single-process and dual-process models of memory in a remember-know-new paradigm

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Recognition memory is often described as being mediated by separate processes of familiarity and recollection. To test for two processes, we ran a remember-know-new paradigm with confidence ratings (with options such as “sure recollect”, “somewhat-sure familiar,” etc.) on younger and elderly adults (n = 46 and n = 81). A critical manipulation was the number of times a word was studied. When this manipulation was crossed with the set of responses, it allowed for the analysis of a rich set of competing models including signal-detection models, discrete-state models, Yonelinas' dual-process model, and Wixted and Mickes' dual-process model. Model comparison through AIC and BIC favored convincingly the simple, single-process signal detection models over all competitors including the more popular dual-process accounts. Furthermore, and against initial expectations, patterns in the data clearly violated diagnostic constraints implied by discrete-state models. Finally, there were no age-related differences — data for younger and elderly adults were described better with signal detection models than with competitor models.

## Wie fühlt sich das an? – Der Zusammenhang von Bedienverhalten und Bediengefühl bei einem passiven translatorischen Bedienelement

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Mit zunehmender Verbreitung aktiver Bedienelemente in Verkehrsmitteln stellt sich die Herausforderung, wie deren Bewegbarkeit konfiguriert werden muss, um eine präzise und hochwertige Bedienbarkeit zu erreichen. Es wurde ein Versuch im zweifaktoriellen Within-Subjects-Design durchgeführt, in dem 11 Probanden einen passiven Schubhebel aus der Schifffahrt bedienten. Dieser hatte drei Rastpositionen, deren haptische Eigenschaften bewertet wurden. Um unterschiedliche Nutzerintentionen abzubilden, wurden verschiedene Bediengeschwindigkeiten mit den Stufen „frei gewählt“, „schnell“ und „langsam“ instruiert. Um Effekte der Position des Nutzers zu untersuchen, wurde zudem die Höhe, in der das Bedienelement angebracht wurde, variiert. Als abhängige Variablen wurden subjektive Ratings von Härte und Eindeutigkeit der Rastfunktion sowie Hochwertigkeit und Angenehmheit erfasst. Außerdem wurden Bewegungsdaten gemessen, die mit den subjektiven Bewertungen der Versuchsteilnehmer korreliert wurden. Die Höhe des Hebels hatte keinen Einfluss auf die Resultate. Die Variation in der empfundenen Eindeutigkeit und Härte wurde vornehmlich durch die Instruktion erzeugt. Bei höheren Bediengeschwindigkeiten wurde die Raste als weniger hart und weniger eindeutig empfunden. In den als schnell instruierten Bedingungen ging mit zunehmender empfundener Härte zunehmende Angenehmheit einher, wohingegen in den langsamen Bedingungen härtere Empfindungen mit weniger angenehmen Bewertungen zusammenhingen. Diese Erkenntnisse sollen genutzt werden, um in Folgeversuchen ein Modell der haptischen Bewertung aktiver Stellteile zu entwickeln.

**Short-term memory for serial order information co-develops  
with reading skills in elementary school children**

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The distinction between short-term memory (STM) for serial order and item retention has recently proven fruitful in several aspects of language development and reading. To investigate the precise relations of order STM and reading development, we tested serial order and item recognition in 114 elementary school children from grades 1 through 4. In a controlled 2 (task) x 2 (material) experiment, short-term recognition tasks for order and item information were furnished with verbal (letters and numbers) and nonverbal material (nonsense symbols). Serial order information was irrelevant to solving the item task, but it was crucial to answer the serial order task. Results suggest that reading skills are related to STM for serial order information, while item retention is best predicted by general intellectual ability. The relation of reading and serial order performance held for verbal and for nonverbal material, suggesting a general serial order mechanism in STM. Specificity though was reflected in retention mechanisms for modalities. While nonverbal material triggered more recency effects, verbal material showed better performance for primary stimuli. Since reading skills and serial order STM performance also correlated with age, we argue that both skills co-develop during the early years of literacy acquisition.

**Snakes in the Streets? The Threat-Superiority Effect Depends  
on Ecological Congruence between Targets and Distractors**

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Introduction. Humans are faster to respond to threatening than nonthreatening target stimuli when presented in an array of distractors (Öhman, Flykt, & Esteves, 2001). This has been shown for both ecologically ancestral (e.g., snakes) and modern (e.g., guns) threats (Blanchette, 2006). In prior research, target stimuli have usually been ecologically congruent with distractors (e.g., snakes have been presented among flowers and guns among toasters). We conducted two experiments to determine whether threat superiority occurs under conditions of ecological incongruence (e.g., a gun among birds). Method. In both experiments subjects viewed arrays of pictures and indicated whether all the pictures belonged to the same category (e.g., all trees) or one picture belonged to a different category (e.g., 1 snake among 8 trees). Four categories of target stimuli (ancestral/modern X nonthreatening/threatening) were presented in arrays of ancestral or modern distractor stimuli. Results. As in past research, we found faster responding to displays with threatening than nonthreatening targets, when targets and distractors were ecologically congruent (e.g., ancestral target in a display of ancestral distractors). This effect did not occur, however, when targets and distractors were ecologically incongruent. We discuss the implications of this finding for evolutionary psychological theorizing about the visuoattentional system.

## Effects of different feedback types on information integration in repeated monetary gambles

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Most models of how people deal with risky choices assume that all relevant information is taken into account (e.g., Kahneman & Tversky, 1979; von Neumann & Morgenstern, 1944), whereas others suppose that only a portion of the information is considered (e.g., Brandstätter et al., 2006). To further investigate whether participants based their decisions in simple monetary gambles on the winning probabilities, on the possible gains, or on both, we conducted a series of three experiments in which participants had repeatedly to choose between two lotteries. As feedback is a crucial factor for repeated choices, we examined to what extent different types of feedback—no feedback, outcome feedback, and error feedback—changed how the information was used. The participants mostly chose the lottery with the higher winning probability, and largely ignored the potential gains when feedback was absent. This pattern did not change when the outcome of each decision was reported. Only after employing error feedback (i.e., reporting when choices were not EV-optimal), the choice pattern changed substantially. Choices were based on the lotteries' probabilities and gains, resulting in more optimal choices.

## The premotor network facilitates serial prediction in patients suffering from Parkinson's disease

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In a recent fMRI study we found patients suffering from Parkinson's disease to be impaired in the serial prediction task, a cognitive task, because of hypoactivity of the motor circuit. We also observed accompanying hyperactivity of the lateral premotor cortex which sustained performance when 'off' medication. To extend these results, in the present study we examined the impact of deep-brain stimulation on the interplay of the putamen and mesial and lateral premotor areas while performing the serial prediction task. To this end, we measured 10 male Parkinson patients 'on' and 'off' deep brain stimulation and 10 healthy male control participants matched for age in a PET study. As expected, Parkinson patients showed poorer performance than healthy controls, and a trend for poorer performance 'off' compared to 'on' stimulation. Concurrently, we found less activation of the putamen in patients 'on' compared to controls and less activation of the pre-SMA and putamen 'on' compared to 'off' stimulation. Furthermore patients 'on' showed more activity of the lateral premotor cortex than controls. These results confirm that affection of the motor circuit has impact on the prediction of serial stimuli in Parkinson's disease while activation of the lateral premotor cortex provides a compensatory mechanism.

## **The influence of pragmatic goals on learning**

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Most learning models assume, either implicitly or explicitly, that the goal of learning is to acquire a veridical representation of the world. In other words, they assume that learning is driven by epistemic goals. We propose instead that people are relatively frugal learners, that learning is driven by pragmatic goals and that learners adapt their strategies of knowledge acquisition to these goals. This entails that learner should focus on goal-relevant information while ignoring goal-irrelevant features of the environment during learning. Experiment 1 provides behavioral evidence that the knowledge acquired during simple outcome learning is goal-dependent. Based on the same learning input participants derived differential knowledge depending on whether they were asked to learn about outcomes, maximize or minimize them. Experiment 2 used eye-tracking to show that attention during learning is allocated depending on the pragmatic goals pursued. We discuss the implications of these findings for theories of learning.

## **Object affordances and motor actions: How specific is the link?**

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Many objects have a strong link to specific motor actions, referred to as object affordances. A mug, for example, is strongly linked to a grasping action. However, a mug can afford different types of grasping actions. Depending on the orientation of the handle, this object can either afford a precision grip or a power grip. The present experiment aims to shed light on the influence of that matching of object affordance and executed movement. To this end, participants had to initiate a unimanual precision or power grip as fast as possible in response to a real 3D object (mug with a handle attached to one side). The type of grip depended on the orientation of the mug (upright or inverted). The object was reachable or out of reach and the task-irrelevant position of the handle was congruent or incongruent to the type of grip. Results show compatibility effects for both grip types shown by a decrease in reaction time if the object was within the reaching space. This indicates that the matching of movement and object affordance exerts a rather specific automatic influence on action planning, but only if the object is located within the action space of the individual.

**For Whom Absence Breeds Preference: Epistemic Motivation Predicts  
Evaluative Conditioning with Negative Contingencies**

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Evaluative conditioning (EC) refers to changes in liking of conditioned stimuli (CS) that are due to their pairing with other liked or disliked unconditioned stimuli (US; De Houwer, 2007). Although the finding that EC can be demonstrated with partial and even negative CS–US contingencies is of great theoretical relevance (Baeyens, Hermans, & Eelen, 1993; Kattner, 2014), its boundary conditions have not been explored. In order to close this gap, we test for a moderating role of epistemic motivation in predicting the independence of EC from CS–US contingency. Specifically, we argue that the motivation towards seeking firm answers and towards avoiding ambiguity (need for cognitive closure, NfCC; Kruglanski & Webster, 1996) prevents individuals from adjusting their CS evaluations for disconfirmatory evidence, and to form CS evaluations attuned to the CS–US co–occurrence rather than to the contingency. Consistent with this hypothesis, EC emerged with negative CS–US contingencies in participants high in NfCC, but reversed in participants low in NfCC. Implications for the underlying processes of EC are discussed.

**There and back again – Landmark–based wayfinding**

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We are all familiar with finding certain locations or paths in unknown environments. However, what happens when we successfully reached our destination? We then need to find the way back! How do we do that? Probably, we are not trying to do it the way Hänsel and Gretel tried to find the way back out of the forest by leaving a line of breadcrumbs. Since empirical research on the return path is rare in psychological research, we here provide empirical evidence from several experiments on landmark–based wayfinding research on the perceptual and cognitive processes included in finding a return path. Based on our theoretical assumptions about the ideal landmark position at an intersection and the empirical findings from previous experiments, our current experiments show the following: The cognitive evaluation of the landmark–intersection configuration in dependence of the task (finding the initial path versus the return path) is an essential aspect, besides the bottom–up aspects (perceptual salience and structural salience). We will discuss these findings in the broad context of wayfinding and spatial cognition.

## Higher sensitivity to sweet and salty tastes in obese adults

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Although putatively taste has been associated with obesity as one of the factors governing food intake, previous studies have failed to find a consistent link between taste perception and Body Mass Index (BMI). A comprehensive comparison of both thresholds and hedonics for all four taste modalities has only been carried out with a very small sample size in adults. In the present exploratory study, we compared 23 obese (BMI>30), and 31 lean (BMI<25) individuals on three dimensions of taste perception – recognition thresholds, perceived intensity, and valence – using ranges of 13 log-diluted concentrations of sucrose (sweet), sodium chloride (NaCl; salty), citric acid (sour), and quinine hydrochloride (bitter). Thresholds were calculated with a maximum likelihood procedure called QUEST. Intensity and valence ratings were acquired using visual analog scales. It was found that the obese participants had lower thresholds than lean for sucrose, and NaCl, indicating a higher sensitivity to sweet and salty tastes. This was also reflected in ratings of perceived intensity, which were significantly higher in the obese group for sweet, salty, and sour tastes.

## Modulation of speech and language functions with TMS

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A conversation in a noisy environment, a friend looking for a missing word – on a daily basis, we are confronted with incomplete verbal information that allows to generate predictions regarding the missing input. Over the last decade, predictive processing as a core mechanism of human information processing has gained substantial interest (see e.g. Friston & Kiebel, 2009). Investigating linguistic predictions, however, bears experimental challenges, as predictions are not directly accessible to observation. Using combined eye tracking and functional magnetic resonance imaging in a delayed reading task, we offer one possibility to provide evidence for the existence of linguistic predictions in an experimental paradigm and assess predictive processes in the absence of simultaneously ongoing processing of incoming words. Conditions triggering the prediction of the word category of the missing word elicited enhanced neurophysiological activity in regions formerly implicated in sequential processing. If participants were able to predict a specific word, additional activity was found in areas commonly associated with (lexical-)semantic processing as well as visual processing areas. In sum, our results suggest that word prediction relies on the interaction of domain-general sequence processing systems with cortical language systems.

## Im Hoch und Tief der Gefühle – Vom Zusammenhang von Wort, Emotion und Raum

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Meier und Robinson (2004) zeigten in ihrer Studie für englische Wörter, dass ein Zusammenhang zwischen deren Valenz und der Position im Raum besteht. Problematisch daran ist, dass Wörter eine inhärente Richtung besitzen können, z.B. der „Himmel“ ist immer oben. In dieser Studie versuchten wir die Konfundierung von Raum, emotionaler Valenz und inhärenter Richtung zu dissoziieren. Als Stimuli dienten 216 deutsche Wörter verschiedener Wortklassen (Nomen, Verben), Valenzen (positiv, neutral, negativ), Abstraktheitsgrade (konkret, abstrakt), Arousals (hoch, niedrig) und inhärenter Richtungen (oben, mittig, unten). Die Probanden bewerteten diese Wörter auf ihre vertikale Position im Raum in einem Fragebogen mithilfe einer 7-stufigen Skala von „oben“ bis „unten“. Die Ergebnisse bestätigten den Zusammenhang von Position im Raum und der Valenz des Wortes: je positiver das Wort, desto höher seine Position im Raum (z.B. „segeln“ ist höher als „stürzen“). Aber auch die inhärente Richtung spielt eine bedeutende Rolle: negative Nomen mit der inhärenten Richtung „oben“ (z.B. „Befehl“) wurden weiter unten eingestuft als positive Nomen mit der inhärenten Richtung „oben“ (z.B. „Segen“). Zudem stellte sich heraus, dass abstrakte Wörter eindeutiger bewertet wurden als konkrete. Die Ergebnisse unterstützen Embodiment-Theorien, dass mentale Repräsentationen emotionaler Wörter auf konkreten sensorischen Erfahrungen wie die Anordnung im Raum beruhen.

### Sleep Deprivation and Advice Taking

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Judgments in many political, economic or medical contexts are often made while sleep deprived. Furthermore, in such contexts decision makers are required to integrate information provided by – more or less qualified – advisors. This raises the question of whether sleep deprivation affects advice taking. We conducted a 2 (sleep deprivation: yes/no) × 2 (quality of advice: high/medium) experimental study to examine the effects of sleep deprivation on advice taking in an estimation task. We compared participants with one night of total sleep deprivation to participants with a night of normal sleep. Quality of advice was manipulated within subjects. Our analyses revealed that sleep deprived participants showed increased advice taking. Moreover, sleep deprived participants benefited more from high quality advice in terms of stronger improvement in judgmental accuracy than participants in the control condition. Two interpretations are viable for our findings: sensitivity to sleep-deprivation induced impairments and higher susceptibility to social influence.

## **Suspending the dynamic representation of gravity**

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When people are asked to indicate the vanishing location of a moving target, errors in the direction of motion (representational momentum) and in the direction of gravity (representational gravity) are usually found. These errors possess a temporal course wherein the memory for the location of the target drifts downwards with increasing temporal intervals between the target's disappearance and the participant's response (representational trajectory). We sought to assess if representational trajectory is a body-referenced or a world-referenced phenomenon. A behavioral localization method was employed with retention times between 0 and 1400 ms systematically imposed after the target's disappearance. The target could move horizontally (rightwards or leftwards) or vertically (upwards or downwards). Body posture was varied in a counterbalanced order between sitting upright and lying on the side (left lateral decubitus position). In the upright task, the memory for target location drifted downwards with time in the direction of gravity. This time course did not emerge for the decubitus task, where idiotropic dominance was found. We conclude that the dynamic visual representation of gravity is neither purely body-referenced nor purely world-referenced. It seems to be modulated instead by the relationship between the idiotropic vector and physical gravity.

## **Response time modeling for finite-state models of recognition**

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Research on recognition memory is concerned with processes underlying recognition of previously learned items in a list consisting of old and new test items. However, most recognition models describe only the pattern of observed responses and neglect information about their speed. To overcome this limitation, we propose an extension of the two-high-threshold model (2HTM) of recognition that incorporates response times (RTs). The extended model assigns separate latent RT distributions to the hypothesized discrete states and thereby implements conditional independence of responses and RTs, a core property of finite-state models. Instead of modeling continuous RTs by relying on distributional assumptions, responses are categorized from fast to slow into several bins. The model is tested in a recognition memory experiment manipulating response bias and memory strength within participants. The results indicate that target recognition is relatively fast compared to slow guessing, with distractor detection in between. Moreover, the inclusion of RTs stabilizes the core parameter estimates of the 2HTM and allows for testing hypotheses on the relative speed of latent processes.

**A modified version of the AX Continuous performance task  
to investigate proactive and reactive control**

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The AX-Continuous-Performance-Task (AX-CPT) is a useful paradigm to investigate processes of proactive and reactive control. In this task, the cue A or B is followed by a probe X or Y resulting in AX, AY, BX, and BY trials. Only on AX trials, participants give a target response, otherwise a non-target response. AX sequences occur with 70%, the others with 10% each. Proactive control typically impairs performance in AY trials because the cue-triggered response activation must be inhibited. Reactive control typically impairs performance on BX trials because the X in most of its occurrences is answered with the target response. The aim of the present study was to investigate whether this effect would survive a modification of the paradigm such that the cue no longer allows a response-activation. To this end, the number of probes (one or two symbols) now defined – depending on the cue – the correct response. That is, the cue allowed for rule-activation but no longer for response-activation. 25 participants were tested with this modified AX-CPT. The data pattern in reaction times and error rates resembles that of the standard AX-CPT, suggesting the involvement of proactive and reactive control also in this modified version of the AX-CPT.

**Advances in the indirect measurement of beliefs – Introducing the Relational Responding Task**

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The Relational Responding Task (RRT) is a new (latency-based) indirect measure aimed at capturing spontaneously activated propositional knowledge. The RRT requires participants to judge the truth-value of a series of propositions under two conditions: In one block of trials, participants are asked to behave as a person who endorses a specific belief (e.g., Belgians are more intelligent than refugees). In the second block, they are asked to behave as a person who endorses the opposite belief (e.g., Belgians are less intelligent than refugees). Based on the assumption that participants automatically evaluate the truth-value of the propositions in terms of their own, personal beliefs, they are expected to respond faster and more accurately to statements when the response rule matches their personal beliefs as compared to when the response rule is inconsistent with their personal beliefs. This assumption was confirmed in two studies assessing subtle racism (Experiment 1) and body dissatisfaction (Experiment 2). Implications for the indirect measurement of beliefs will be discussed.

## **If so many are „few“, how few are „many“? Experimental change of quantifier semantics.**

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Quantoren sind Wörter wie „viele“, die Mengen beschreiben. Ihre Verarbeitung wird durch ein links-fronto-parietales Netzwerk unterstützt. In Experiment1 hörten Probanden Sätze wie „Viele der Kreise sind gelb“ und entschieden, ob diese ein Stimulusbild adäquat beschrieben. In Block1 wurde das Verhalten der Probanden bei verschiedenen Anteilen von blauen/gelben Kreisen ermittelt. 40% Kreise einer Farbe wurden nicht als „viele“ bezeichnet. In Block2 wurden Probanden trainiert, auch 40% Kreise „viele“ zu nennen. Block3 war analog zu Block1. Blocks4–6 erfolgten analog für „wenige“ für 60% Kreise der genannten Farbe. Es gab einen Lerneffekt von Block1 zu Block3 für den trainierten Quantor „viele“ und einen Transfer auf „wenige“ in Block3. Ein analoges Muster mit Transfer auf „viele“ zeigte sich beim Training für „wenige“ von Block4 zu Block6. In Experiment2 (fMRT) führten gesunde erwachsene Probanden Blocks 1–3 durch. Die Ergebnisse aus Experiment1 wurden repliziert. In der Bildgebung zeigten sich lerninduzierte Effekte für den trainierten Quantor „viele“ im semantischen Netz, insbesondere in Areal 45 der Broca-Region. Diese Effekte waren analog für die kritische Proportion „40%“ auch für den nicht-trainierten Quantor „wenige“ zu finden. Das semantische Netz in Kognition und Gehirn ist also trainierbar; diese Trainingseffekte generalisieren auch auf nicht-trainierte Konzepte, die mit dem trainierten in Beziehung stehen.

## **The influence of object similarity on object-based cueing effects**

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Participants tend to respond faster and more accurate to targets that appear at a non-cued position within the same object compared to a different object. These object-based cueing effects have been taken as evidence that visual attention cannot only be oriented in space but can also be oriented towards objects (Egley, Driver & Rafal, 1994). In particular, it could be more difficult to move attention between objects than within the same object (Lamy & Egeth, 2002). It is unclear, however, whether object-based cueing effects are really caused by attentional factors, or whether they could be due to other, non-attentional effects, as for example the order in which the objects are searched (Shomstein & Yantis, 2004). According to the attentional account the more distinct objects are from each other, the stronger the object-based cueing effects should be, whereas non-attentional explanations would not predict any effect. We manipulated object similarity by presenting in 33% of the trials one of two objects in a different color. We found that while the space-based cueing effect was unaffected by the color manipulation, the object-based effect was increased when the objects were different in color, supporting attention-based accounts of object-based cueing effects.

## **Führung unter dem Aspekt des demographischen Wandels**

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Bedingt durch den demographischen Wandel wird die Arbeitswelt zunehmend von älteren Erwerbstätigen sowie alters- bzw. generationengemischten Teams geprägt sein. Derartige gesellschaftliche Veränderungen erfordern Maßnahmen auf Personalentwicklungsebene. Da Führungskräfte als Multiplikatoren in Unternehmen gelten und Führungsverhalten erwiesenermaßen zum Erhalt und zur Förderung von Arbeitsfähigkeit beiträgt, kommt insbesondere der Führung älterer Mitarbeiter und generationengemischter Arbeitsteams zentrale Bedeutung zu. In Generationsvergleichen zeigten sich bereits differenzierende Präferenzen bezüglich des Führungsstils. Erste Studien fanden zudem generationsbezogene Unterschiede hinsichtlich Arbeitsperspektiven, Karriereansichten, Motivatoren und Motiven bei der Arbeit, der Zielorientierung oder der Einstellung gegenüber Autorität. Der Transfer derartiger wissenschaftlicher Erkenntnisse in die Führungspraxis ist bisher allerdings noch wenig ausgeprägt. Ziel der angedachten Studie ist daher die Entwicklung, praktische Erprobung und Evaluation einer Intervention für Führungskräfte zur Verbesserung der Führungskompetenz in alters- und generationengemischten Teams und zur Schulung im Umgang mit älteren Mitarbeitern. Zudem sollen die Auswirkungen des Führungsverhaltens auf die Arbeitsfähigkeit und Arbeitsmotivation von Mitarbeitern sowie verschiedene teambezogene Variablen in altersdiversen Teams untersucht werden.

### **Does procedural priming change the ability or motivation to think globally or locally?**

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Many studies suggest that procedural priming can induce a global versus local processing focus. However, little is known about how exactly procedural priming influences later global-local tasks. We propose that at least two pathways underlie such procedural priming: a change in ability and a change in motivation to think locally/globally. We hypothesized that changes in ability manifest in priming-effects even if a global versus local focus was directed by instructions. Changes in motivation should manifest in priming-effects if participants can freely choose a global versus local focus. After participants had repeatedly generated superordinate-category words (global priming) versus subordinate examples (local priming) to presented nouns, we manipulated if participants' conceptual processing focus in a second task was directed by instructions or freely chosen. The generated number of superordinate versus subordinate words in the second task served as dependent measure. Results indicate that procedural priming was absent when the focus was directed by instructions, but present in the free focus task. Whereas in former studies, the motivational component in procedural priming of processing foci was largely ignored or intermixed with ability processes, this study shows that it plays the primary role in a conceptual task.

## How does Emil feel? Emotional Implicit Sequence Learning

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Implicit sequence learning describes the ability to react faster to sequences of repeating stimuli without explicit knowledge of what has been learned. However, this well-established effect has not yet been investigated with emotional stimuli. We conducted a series of experiments in which we used faces with emotional expressions as stimuli in an implicit sequence learning paradigm. The participants had to react to the position of the emotional stimuli or the identity of the person. For both tasks the results revealed that the presence of emotional stimuli had no effect on implicit sequence learning and emotional deviants in the learned sequence had no differential effect on reaction times. Although the emotional valence of facial expressions, in particular those that are unexpected, are of high relevance in everyday life, they do not seem to effect implicit sequence learning if they are task irrelevant.

## The influence of motor familiarity on information processing

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It is well known that motor experiences and the associated mental representations impact motor performance in general. In relation to the information processing component, it has been shown, that motor learning influences the processing speed. Indeed, there is no conclusive evidence how motor familiarity affects the information processing component in a natural setting. On this background, the present study examined if the familiarity with a motor task influences the speed of information processing in a natural environment. 11 skilled to high-skilled team handball goalkeepers (mean age = 21.2 years, SD = 4.1) performed a familiar and non-familiar two choice reaction time (2CRT) task in a block-randomized order. Reaction times were measured using motion capture data and analyzed by fitting the ex-Gaussian distribution to the RT data. The results show that participants' mean RTs were shorter in the familiar compared to the non-familiar 2CRT task and statistically significant differences occurred in the ex-Gaussian parameter tau which describes the distribution's skewness. Therefore, it is concluded that motor familiarity increases the speed of information processing which might be due to a faster response programming in the familiar 2CRT task.

## **Reducing and reinstating bias: The influence of attention on preferences between risky prospects**

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The recently introduced Open Sampling presentation format for risky choices, in which outcomes are presented simultaneously and openly in matrix form, has been shown to enable fast and – in comparison to other displays of gambles – relatively unbiased decisions. Thus, the choices correspond to those dictated by the economic norm, namely the options with the higher expected value, more often than in other display formats. We argue that these choices are results of fast, extensive, and unbiased sampling from the given information, drawing upon automatic processes of information acquisition. Using eye-tracking, we confirm that sampling is indeed representative with respect to the information given, providing decision-makers with an accurate representation of the options at hand. This result, however, implies that preferences may be swayed by any intervention that biases decision-makers' representations of their options. In two further studies, we demonstrate that choices can be biased by subtle changes in the matrix display, and that these biases are, in turn, mediated by induced shifts in attention. This result suggests that systematic choice tendencies and biases may be due to distortions in the information used, as opposed to transformations of data by decision makers, or faulty or heuristic integration processes.

## **Temporal dynamics in EEG theta and alpha activity in static and dynamic Health Qigong**

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Health Qigong is a common technique of Traditional Chinese Medicine applied to strengthen mental and physical health. Several studies report increased EEG theta and alpha activity after Qigong exercise indicating a relaxed state of mind. In the current study, we compared effects of two Health Qigong techniques on EEG theta and alpha activity. Subjects performed the techniques 'Wu Qin Xi' (dynamic Qigong) and 'Liu Zi Jue' (static Qigong) in a within-subjects design. Eyes-open and eyes-closed resting EEG was recorded before and immediately after each 15-minute exercise block. Results show a decrease in alpha activity after 15 minutes, followed by an increase after 30 minutes in static Qigong. Theta activity was decreased after 15 minutes, followed by an increase after 30 minutes in dynamic Qigong. Our results demonstrate different temporal dynamics in theta and alpha activity for static and dynamic Qigong. We hypothesize that the found brain activation patterns result from different attentional focusing performed during static and dynamic Qigong exercise.

## **Blinking behaviour during a purely auditory speech perception task**

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Blinking behavior is assumed to be associated with information processing. When performing a cognitive task, participants blink mostly when information processing is finished. This has been shown in choice response tasks with visual stimuli. In the present study we tested if information processing affects blinking behavior in a purely auditory task, where no visual information was given. In a simulated multi-talker scenario, participants performed a go-nogo speech perception task in which they responded to a word and a following number. Stimuli were simultaneously presented by four speakers at different locations in space. Half of the trials were nogo trials. Blinks occurred preferably at three moments: The first blink was performed around the onset of the stimulus. In go trials, a second blink occurred after the number was presented. In no-go trials, participants blinked earlier, supposedly when identifying the stimulus as a non-target trial. A third blink occurred frequently around the response in go trials or slightly earlier in no-go trials. Thus, it is shown that blinks obviously segment information processing also in auditory tasks. However, in contrast to visual tasks, where blinks never occur before all information processing is finished, blinks may also occur preceding the response.

## **How embodied are we really? Processing of self- and other-related words affects emotional and motivational systems in the brain and the body differently**

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There is no doubt. Language is embodied and closely related to the self. This has been shown for the processing of single words and sentences. Activation of sensorimotor programs and emotional brain structures as well as priming of expressive or defensive responses during reading have all been observed and taken as evidence for the fact that we can feel what we read. However, how much embodiment is really required when we process words related to own or other people's feelings? Evidence from a series of studies will be presented. It will be shown that during reading, words related to the reader's own feelings activate bodily emotional and motivational systems differently from words describing other people's feelings. Insight from EEG-experiments suggests that discrimination between words describing own and other-related feelings is an elaborate process, actively construed during reading across processing stages. Neither the insula nor the amygdala but the ventromedial prefrontal cortex, as part of the frontal cortical midline structures, seems to play a crucial role in this active construal of body ownership from words. Together, the results argue in favor of a dynamic and hierarchical organization of embodied peripheral and cerebral subsystems when processing emotions from language stimuli.

## What is chosen first, the hand used for reaching or the target that is reached?

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In many situations one has to select among different objects for interaction. Additionally, one has to choose how to interact with them. This raises the question of which sorts of decisions normally precede which others. Does one first select the object and then a suitable action? Or does one first select an action and then a suitable object? This question was addressed by asking participants to aim for either of two target objects with either hand based on whichever combination seemed easiest. The choices made in this free condition were compared to choices made when either object or target selection were constrained. A model assuming similar selection processes in the free condition and in the action-constrained condition (in which action selection necessarily preceded object choice) provided the best account for the data. This result accords with the hypothesis that hand was generally chosen first in the free choice condition.

## Visual flicker affects temporal expectations and temporal productions

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Previous studies have shown that visual flicker prolongs explicit temporal judgments. It is, however, unclear whether flicker affects a basic timing module or rather the response stage of the timing process. This question is difficult to answer based on explicit timing tasks, in which participants directly judge elapsed time. However, if flicker affects performance even in an implicit task that requires directing attention to a specific point in time, but not reporting a time interval, flicker is more likely to affect core timing processes rather than the response stage. We used a time-to-contact task to test implicit timing. A ball moved across the screen with constant velocity until it was concealed “behind” a flickering or static occluder. Subjects indicated with a button press when they expected the ball to reappear from behind the occluder. We compared this task to an explicit temporal reproduction task, in which the duration of a flickering interval had to be matched to a static interval. Flicker affected both, implicit and explicit duration judgments similarly. This leads us to conclude that flicker affects basic timing mechanisms rather than the response stage. Furthermore, the results suggest that both tasks share some basic cognitive timing processes.

## Role of Teacher Emotion on Student Learning: Instructional Value of Affective Feedback

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**Aim:** Teacher emotion in instructional practice highlights how affect is an indirect source of informational value for students, beyond objective performance measures. The current work seeks to replicate Graham's (1984) findings of teacher affective feedback cues (anger vs. pity) on student attributional processes, whereby anger and pity feedback in response to induced failure on a task, lead to causal judgments of lack of effort and lack of ability (respectively). **Methods:** Participants receive feedback on their task performance (computer-based), allegedly provided by another participant who received their results electronically. Participants, unaware of their actual performance, are reliant on this feedback to gauge their performance. In a randomized 3-block design (3 1-min trials per block), feedback is given twice, after Block 1 and 2. All participants undergo failure induction; between-subject conditions (anger, pity, control) are achieved through manipulation of specific affective feedback, comprising visual (emoticon) and verbal (emotion label) components. A final trial (no time limit) measures post-feedback task persistence. **Results:** Significant affectXcause interaction effects are expected, mirroring Graham's findings, challenging the notion that positive affect is more conducive to learning (Van Doorn et al., 2014). Measures of self-concept, implicit theory of intelligence, and need for cognition/structure, are also assessed as potential moderators.

## Exploring the boundary conditions of unconscious numerical priming effects with continuous flash suppression

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In recent years, the notion that continuous flash suppression (CFS) can be used to bias visual processing for the dorsal stream, as compared with the ventral stream, has become increasingly popular. CFS is a powerful variant of binocular rivalry that allows to deterministically control the perceptual dominance of visual stimuli. According to the "dorsal bias" notion, there is some form of privileged access of perceptually suppressed information to the dorsal visual stream, and parietal cortex in particular. Based on the functional overlap of dorsal-stream visuospatial and numerical processing in human parietal cortex, it has been hypothesized that numerosity judgments should exhibit preserved unconscious priming during interocular suppression by CFS. Here, we investigated the scope and limits of numerical priming under CFS using non-symbolic primes and targets (arrays of Gabor patches). Specifically, we asked a) whether previously observed unconscious priming effects in the subitizing range generalize to larger numerosities, and b) whether the numerical target-prime distance modulates the priming effect. We discuss our findings with respect to recent studies that reported conflicting numerosity priming effects under CFS. We conclude that there is no compelling neuroimaging or behavioral evidence for a privileged access of visual information to dorsal stream processing under CFS.

## Reaction time effects can be detected reliably in web-experiments

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Although research conducted via the internet has become commonplace, it still spurs skepticism from reviewers and editors, especially whenever response latencies are the data type of interest. Essentially, there is a persistent preconception that web-experiments may be ill-suited to investigate response time effects in the range of only a few hundred milliseconds. To critically test this presumption, participants in the current experiment were randomly assigned to complete a lexical decision task either (a) online (at any computer they chose) or (b) via the internet but in the lab using the same browser, or (c) in the lab using standard-software for creating experiments (E-Prime). The classical word frequency effect – that frequent words are recognized faster (over pseudowords) than infrequent words – was typical (in the range of 160ms to 200ms) and very large (Cohen's  $d > 1.0$ ) in all three conditions. More importantly, there was no indication that web-based data collection was in any way inferior in detecting the effect. In fact, the largest effect size was observed for condition (b). As such, the current experiment contradicts the still common preconception that reaction time effects of only a few hundred milliseconds will be less reliably detected in web-experiments.

## Fast Food: Speedup In Visual-Olfactory Food Object Identification

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Multisensory integration is one vital component in food perception. Different sensory inputs, including the visual appearance, taste and smell, give rise to the unitary percept we call flavor. The underlying neural processes involved in the formation of flavor are still unclear. We tested whether the perception of congruent bimodal visual-olfactory objects is facilitated compared to their unimodal components by measuring response times. A response time speedup can be indicative of multimodal integration. Participants were presented with images and odors of four different objects (banana, coffee, lemon, vegetables) alone and in congruent bimodal combinations. Stimulus intensities were selected based on individual identification thresholds obtained in a separate session. Participants were to press a button as soon as they had identified an object. Bimodal objects were identified faster than either of their unimodal components. We estimated the cumulative response time (RT) distribution functions for every condition and tested for violations of the race-model inequality (RMI); we found significant violations of the RMI for fast responses, which indicates that multisensory integration took place at early processing stages of the identification of food-related objects. Notably, we observed great inter-individual differences in the magnitude of facilitation, possibly as the result of individual preferences.

## **Eine experimentelle Validierung des Crosswise-Modells**

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Indirekte Befragungstechniken wie das Crosswise-Modell (Yu, Tian & Tang, 2008) zielen darauf ab, die Validität von Selbstauskünften in Umfragen zu sensiblen Merkmalen durch die garantierte Vertraulichkeit individueller Antworten zu erhöhen. Den Goldstandard bei der Validierung indirekter Befragungstechniken stellen sogenannte „starke“ Validierungsstudien dar, bei denen die bekannte Prävalenz eines sensiblen Merkmals als objektives Außenkriterium herangezogen werden kann. Um starke Validierungsstudien auch in Online-Untersuchungen zu ermöglichen, wurde ein Paradigma entwickelt, das ein sensibles Merkmal mit bekannter Prävalenz in einer Stichprobe zu erzeugen vermag. Hierzu wurde Versuchsteilnehmern für die Lösung von drei Anagrammrätseln eine Belohnung in Aussicht gestellt. Das dritte dieser Anagramme hatte sich jedoch in einer Vorstudie als unlösbar erwiesen. Dennoch entschieden sich 15.5% von 664 Teilnehmern anzugeben, sie hätten alle drei Anagramme gelöst; diese Teilnehmer wurden als Betrüger klassifiziert. Während eine konventionelle direkte Frage den Anteil von Betrügern drastisch unterschätzte (5.1%), konnte mit Hilfe des Crosswise-Modells ein adäquater Schätzer gewonnen werden (13.0%). Die Ergebnisse zeigen, dass das Crosswise-Modell den Einfluss sozialer Erwünschtheit erfolgreich zu kontrollieren vermag und valide Prävalenzschätzungen für sensible Merkmale ermöglicht.

## **How forgetting affects rule- and exemplar-based judgments**

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People often forget previously acquired knowledge over time, like the names of former classmates. Likewise, how accurately people make judgments may vary as a function of forgetting over time. To make judgments, people often rely on two kinds of strategies: rule-based and exemplar-based strategies. Exemplar-based strategies assume that people retrieve past exemplars from long-term memory, whereas rule-based strategies do not require storage of past exemplars. Accordingly, exemplar-based strategies may be more prone to forgetting than rule-based strategies. To investigate this hypothesis, 80 participants learned in a training phase to make rule-based or exemplar-based judgments based upon four binary cues. To induce forgetting, we varied within participants the time interval between the training phase and a later test phase from immediate to one day to one week. As predicted, a longer time interval between training and test did not impair judgments for training items in the rule-based task. In the exemplar-based task, however, a longer time interval between training and test led to less accurate judgments for training items. These results suggest that forgetting harms exemplar-based judgments more than rule-based judgments.

## Wie generalisieren assoziativ und regelbasiert erworbene Bewertungen?

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Wenn sich die Bewertung eines neutralen Reizes (CS) nach wiederholter Paarung mit positiven bzw. negativen Reizen (US) verändert, spricht man von einem Evaluativen Konditionierungseffekt (EC). Umstritten ist jedoch wie EC-Effekte zustande kommen. Diskutiert werden Ein-Prozess-Modelle, die propositionale Prozesse postulieren, und Zwei-Prozess-Modelle, die zusätzlich assoziative Prozesse annehmen. Um zu überprüfen ob die Zusatzannahme eines zweiten Prozesses gerechtfertigt ist, möchten wir die Generalisierung von EC-Effekten auf neue Reize anhand von Paradigmen aus der Lernforschung untersuchen. Ein dort etabliertes Generalisierungsphänomen, welches als Evidenz für assoziative Prozesse interpretiert wird, ist, dass die konditionierte Reaktion unter bestimmten Bedingungen häufiger auf einen neuen Reiz gezeigt wird als auf den konditionierten Reiz selbst. Dieser Effekt ist zu beobachten, wenn zwei Reize, von denen einer die Anwesenheit (CS+) und einer die Abwesenheit (CS-) eines positiven Outcomes anzeigt, sich in Bezug auf eine Stimulusdimension (z.B. Größe) unterscheiden. Wenn beispielsweise CS+ kleiner ist als CS- wird nach der Lernphase auf einen Reiz, der noch kleiner ist als CS+, die maximale Reaktion gezeigt (Peak-Shift). Wir möchten dieses Paradigma auf EC übertragen, indem wir CS+ mit positiven und CS- mit negativen US paaren und testen ob unter Bedingungen, die assoziatives Lernen begünstigen, auch bei EC ein Peak-Shift auftritt.

## Intuitive decision making: The orbitofrontal cortex as an early integrator of incomplete stimulus input

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Intuitive decisions are the most common type of everyday life decisions: those, that are made immediately without conscious, reasoned thought. One way to conceive of intuition is in terms of a preliminary perception of coherence. This perception would be based on a coarse representation of the incomplete stimulus input, which at first cannot be explicitly described, but is still strong enough to guide subsequent decision making (Bowers, Regehr, Balthazard, and Parker, 1990). To disentangle the neural mechanisms underlying this coarse representation, we conducted a line of experiments in which participants had to make coherence judgments by finding a connection between (a) pixels of line drawings or (b) semantic concepts. Neural activation was recorded with magnetoencephalography (MEG). Though activation patterns and time courses differed strongly not only between sensory domains, but also presentation formats, we consistently found activation of the orbitofrontal cortex (OFC) to be linked to the perception of coherence. On the basis of our data we propose a preliminary neural model of intuitive decision making, with the orbitofrontal cortex serving as an early integrator of incomplete stimulus input that provides a representation of the gist of information and guides subsequent processing.

## Taking a long look at rhythms: Distortions of perceived duration due to the temporal structure of interval filling

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The ability to estimate temporal properties like the duration of an interval is an important cognitive function crucial for our successful interaction with the environment. Characterising quantitatively how factors other than physical duration distort duration estimates can help in understanding the mechanisms underlying temporal perception. Here, we present a line of experiments that investigate perceptual distortions produced by the temporal structure of short auditory stimuli making up an interval. We show that temporally irregular intervals are perceived as shorter than temporally regular intervals. This is true for isochronous intervals (i.e., with an equal gap between successive sounds), but also for rhythms with varying, but fully predictable, stimulus spacing (i.e., intervals composed of rhythmic repetition of a group of stimuli). In latter case, an increase in the number of stimuli per rhythmic grouping is found to decrease duration judgments. The general overestimation of isochronous intervals is in accordance with a logarithmic relationship between physical and perceived subinterval duration. A model based on the entrainment of neural activation to regular stimulation may be able to explain the full range of presented findings and serve as a framework for a new interpretation of the mechanisms underlying distortions of perceived duration.

### **Naso–Temporal ERP Differences: Evidence for Increased Inhibition of Temporal Distractors**

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Previous studies suggest an attentional advantage for stimuli in the temporal compared to the nasal visual hemifield (e.g. Rafal, Henik, & Smith, 1991). In the present study, we investigated whether this advantage is genuinely attentional. Participants searched for a colour–defined target stimulus in bilateral displays. Nasal and temporal viewing conditions were realized with an eye–patching procedure. We measured the N2pc component as an indicator of attentional selection of a target stimulus among distractors (Eimer, 1996), and expected a more pronounced N2pc for targets in the temporal compared to the nasal visual hemifield. Surprisingly, Experiment 1 showed that the N2pc was reduced for temporal vs. nasal targets. Since, in our design, a target is accompanied by a distractor, and since the N2pc reflects the sum of target and distractor processing, the finding might be explained by increased attentional inhibition of a temporal vs. nasal distractor. Such increased inhibition would be reflected in a larger contralateral positivity (the PD, cf. Hickey, Di Lollo, & McDonald, 2009) to temporal vs. nasal distractors. Experiment 2 introduced distractor–only trials to compare ERP responses for temporal and nasal distractors. As expected, we found a larger contralateral positivity for temporal compared to nasal distractors supporting our interpretation.

## **Cognitive Representation of Dual-Task Demands: Towards a Gestalt View of Human Action**

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Previous theory on dual-task control mainly focused on temporal mechanisms (e.g., serial vs. parallel response selection), whereas comparatively little research has been devoted to structural representations of dual-task demands. Here, we asked whether such demands are represented as the sum of the two component tasks (Structuralist view of action), or as a distinct entity (Gestalt view of action, similar to an unrelated third task) by testing for partial repetition benefits (e.g., in switches from combined task demands [A+B] to single task demands [A]). Experiments 1a/b focused on representations of cross-modal dual-response compounds, whereas Experiment 2 addressed representations of dual-task demands. Overall, there was no evidence for partial repetition benefits when response components repeated across switches. We conclude that dual-response compounds and dual-task demands are represented as a distinct Gestalt, not as a combined activation of component representations. The findings have important implications for basic assumptions of theories on dual-task control that assume structurally similar task representations under single- and dual-task demands.

## **Semantic Relations in Asymmetric Dynamic Social Interactions**

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When processing the semantic relations in a picture, observers are faster in determining the agent (i.e. the acting person) than the patient of an action (i.e. the person receiving an action). This “agent advantage effect” was shown with static pictorial stimulus material (e.g., one fish biting another fish). We investigated whether this effect also holds true for dynamic social interactions (e.g. one person pushing another person). The most important difference between static and dynamic stimuli is the amount of change per time unit, which is different for agents and patients. Participants viewed dynamic animations depicting two stick figures with one patting the other on the shoulder. The viewing angle on this interaction as well as the start frame of the movement were systematically varied and randomly presented. Participants were instructed to search for the agent (i.e. the person patting) and the patient (i.e. the person being patted; order counterbalanced across participants) in these interactions and to press the button corresponding to the location on the screen. Results indicated a reversed “agent advantage effect” with the participants being more correct when searching for the patient. This suggests that motion information derived from the dynamic interactions interacts with semantic processing.

## **Compensatory Motivation Following Unintentional Group Norm Violations: Evidence from Professional Soccer**

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Team members may have good reasons to intentionally violate central team norms (e.g., moral rebellion). While research has investigated those mechanisms, unintentional violations of team norms have not yet received similar attention. In this research, we focus on violations of the norm not to hurt the own team. We predicted that team members who unintentionally hurt this norm, are motivated to compensate for their transgression, and that this compensatory motivation is the stronger the more harm the own transgression did to the team. We focused our analysis on own goals (i.e., hitting the own instead of the opposing team's goal) that soccer players scored in the first German Soccer League. We analyzed whether soccer players are more likely to score a regular goal following an own goal compared to both their regular goal scoring frequency and the frequency to score a regular goal after the opposing team scored a regular goal. We found that soccer players are more likely to score regular goals following own goals compared to both standards. The increase in goal frequency was the stronger the more harm the own goal did to the team. Unintentional team norm violations thus appear to be followed by strong compensatory motivation aimed at minimizing the harm inflicted on the team.

## **Electrophysiological correlates in rule reversals and rule violations**

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According to conflict monitoring theory the ERN is determined by the amount of conflict between response representations. In our experimental paradigm we intended to evoke cognitive conflict by instructing participants to violate a rule which they had previously learned. Furthermore, we divided our sample in two groups with a) low and b) high values on a conscientiousness scale. In this setting, we assumed that conscientious participants would experience larger conflict when being asked to violate a rule. In accordance with assumptions of the conflict monitoring theory this should lead to a correct-response negativity (CRN). In a simple-choice-reaction-task, subjects (n=47) had to respond to a circle/square by pressing the left/right key. In other conditions, they were asked to violate or reverse the rules. Response times as well as error rates in both the rule violation and reversed rules condition were higher compared to the standard condition. Despite this indication of a conflict between response representations, we found no increased ERN/CRN amplitudes. Furthermore, no difference in response times nor in the amplitudes of the CRN was observed between both conscientiousness groups (high and low), but in error rates. Hence, our results are not in line with assumptions of conflict monitoring theory.

### **Intelligence in open problem space: An EEG study**

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Saskia Jaarsveld, Andreas Fink, Marcus Rinner, Daniela Schwab Mathias Benedek, Thomas Lachmann Intelligence is usually studied as a cognitive faculty assessed with standard test items containing problems that evolve in well defined problem spaces. We registered EEG activation while intelligence operates in undefined problem spaces. In the present study participants (N = 52) created their own intelligence tasks; 3x3 matrices featuring relations between geometrical components. Task related alpha synchronization indicates that intelligence engages with creativity in a solving process that evolves in open problem space. Activity showed especially at prefrontal and frontal sites when information processing was most demanding, i.e. at the start of the creative process due to the multiplicity of ideas and at the end due to the narrowing down of alternatives. This work could open the way to an approach of cognition where intelligence-related abilities are studied in open problem spaces.

### **Overcoming the detrimental effects of intra- and interpersonal anger in negotiations with the help of if-then plans**

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Different forms of anger have detrimental consequences for negotiation success: Both being angry (intrapersonal anger) and being confronted with an angry counterpart (interpersonal anger) impede negotiation success, lowering individual and joint outcomes. The present research investigated how the self-regulatory strategy of making if-then plans may help to counteract these effects. In Study 1, anger after provocation during the negotiation led to both lower joint and individual gains as compared to an unprovoked control group. Participants who had formed an if-then plan to search for mutually beneficial solutions prior to the negotiation attained similarly high outcomes as unprovoked participants. In Study 2, in the course of the negotiation, the participant's counterpart expressed anger and threatened to leave the negotiation. Compared to a control group, this led participants to make more concessions. By contrast, participants who had made an if-then plan to stick to their own offers and think about how they and their counterpart are mutually dependent, conceded just as little as those of the control group. These findings suggest that if-then plans are an easily realizable self-regulatory strategy to counter anger in negotiations. Implications for negotiation theory and directions for future research will be discussed.

## **Reproducibility Project: Background and Motivation**

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The goal of science is to accumulate knowledge. Scientists, however, must also pursue personal goals, such as maintaining a successful career. Scientists gain reputation and reward for publishing. However, not all studies get published. Publishing norms incentivize novel, positive, and tidy results. But, when scientists are pushing at the boundaries of knowledge, evidence is rarely so accommodating. As a consequence, the published literature may present a more interesting, positive, and tidy view of human nature than the reality. That is, the published literature may be less reproducible than expected. Also, there are systemic issues, separate from the nature of the results, that may interfere with reproducibility such as incomplete reporting of methods and effects. The Reproducibility Project aims to empirically estimate the reproducibility of psychological science as well as identify the predictors of reproducibility.

### **An inconsistency in the explanation of backward-crosstalk effects in dual-tasking.**

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When people are required to perform two tasks in close succession, performance already in Task 1 is facilitated if Task 2 requires a compatible response (e.g., when both responses entail a “left” component). Such influences of Task 2 characteristics on Task 1 performance have been coined backward-crosstalk effects (BCEs). To account for BCEs, several authors suggested to sub-divide the central stage of task processing into (1) parallel response-activation followed by (2) serial response-selection: Overlaps in parallel response-activation are then the source for BCEs. Building on the same theoretical framework, the locus-of-slack logic then directly predicts that BCEs should combine underadditively with a manipulation of stimulus onset asynchrony (SOA) in PRP experiments. I report experiments where various versions of BCEs were investigated in such situations. In all these cases, however, the BCEs combined additively with the SOA manipulation. Traditionally, this pattern is taken to argue against the source of an effect being located before the bottleneck – and consequently my results are at odds with the account of BCEs described above.

## Naïve Bayes as a Default in Human Category Learning

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Categorization – a basic human skill – poses a theoretical challenge due to a combinatorial explosion of parameters that are needed as the number of features and classes grows. In machine learning the so-called naïve Bayes classification algorithm reduces the combinatorial explosion with little loss of accuracy in many domains. Do human learners use naïve Bayes or similar strategies to cope with combinatorial complexity in probabilistic classification? We investigate this in two multiple-cue classification tasks, in which we obtained trial-by-trial supervised learning data from 60 SS. We modeled learning dynamics in a Bayesian model framework. Predictive model performance shows: The naïve Bayes principle is (1) a plausible model for initial categorization behavior, and (2) for most subjects more plausible than a more complex and flexible categorization model, yet (3) behavior quickly adapts to match the structure of the environment, given a sufficient amount of contradictory evidence.

## Persons do not use fixed search rules in decision making: The attraction search effect

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One common assumption of many established models for decision making is that information is searched according to some pre-specified search rule. While the termination of information search might be influenced by the content of the information, usually specified as a stopping rule, the direction of information search should not be influenced by such information. We show that this fundamental assumption concerning information search is wrong. In choices between two options based on partially revealed information, participants show systematic effects of previous information on the direction of search. Specifically, information search is directed towards the more attractive alternative given the available advice. We propose first ideas (i.e., work-in-progress) of a consistent extension to the parallel constraint satisfaction network model of decision making to account for this attraction search effect.

## Is space automatically activated by emotional words?

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Considering that many affective metaphors reflect spatial relations, such as feeling down, it has been assumed that their conceptual representation is linked to bodily experiences (Lakoff & Johnson, 1999). Consistent with this assumption, the evaluation of affective words interacts with spatial location (Meier & Robinson, 2004). We further investigated the association between emotional words and space using a lexical decision task to test whether affective words activate spatial location automatically when word valence is not task-relevant. Participants decided whether letter strings appearing at the top, bottom, right or left position of a computer screen were German words or not. Controlling for imageability, arousal and many linguistic variables, we found an effect for valence: Emotional words were faster recognised than neutral words. However, in accordance with previous findings (Kousta et al., 2009), negative and positive words facilitated the decision to the same extent. This result agrees with the finding that the emotional content of a word is accessed very early in word recognition and is a highly automated process. Critically, there was no interaction between emotion and spatial location. Therefore it seems that access to spatial information is not automatic and only activated after further elaboration of an emotional stimulus.

### Using panel data, self-reports, and behavioral data to assess age differences in risk taking

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How does risk taking change across the life span? Various biological, economic, and psychological theories have made predictions about how individual differences in risk attitudes or preferences may change systematically across the life span. Longitudinal and cross-sectional data using self-report data suggest that there are indeed significant life span changes in risk taking. For example, we used data from a large representative sample of over 36,000 individuals that rated their risk-taking propensity in multiple waves of the German Socio-Economic Panel (SOEP, 2004 – 2012) and found that self-reported risk-taking propensity tends to peak early in life and decline across adulthood, albeit age gradients vary significantly by domain (e.g., health, financial, interpersonal; Josef, Richter, Samanez-Larkin, Wagner, Hertwig, Mata, 2014). In turn, behavioral measures of risk taking paint a much more heterogeneous picture, with life span patterns varying considerably between tasks (Mata, Josef, Samanez-Larkin, & Hertwig, 2011). For example, the overall pattern of findings in experiments using monetary gambles provides little evidence of systematic age differences in risk taking, but age differences are more reliably found in tasks involving feedback learning. Overall, these results suggest that more work is needed to close the gap between self-report and behavioral measures of risk taking and, ultimately, capture the mechanisms underlying life span changes in risk attitudes or preferences across tasks and domains.

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### **Event-related brain potentials when processing conflict distracters in a temporal flanker task**

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We investigated the processing of distractor–target conflict by recording event-related brain potentials in a temporal flanker task, in which a target stimulus is preceded by a congruent or an incongruent distractor presented in the same location. Similar to the standard flanker task, conflict occurs when distractor and target are incongruent. Here, we manipulated the proportion of conflict trials between different parts of the experimental session. Consistent with the behavioral results that displayed larger distractor interference in blocks with infrequent conflict, distractor-evoked response activation, assessed by lateralized readiness potentials, was also larger in these blocks. Target-locked brain waves displayed a pronounced negativity in conflict trials when conflict was infrequent, peaking about 260 ms after stimulus onset. This may reflect enhanced conflict strength owed to reduced attentional focusing or the detection of incorrect response preparation, possibly signalled by perceptual distractor–target mismatch.

### **Aging and visual working memory: Evidence for an age-specific delay in filtering out distractors**

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Working memory (WM) capacity varies across individuals and declines with age. Whereas the ability to filter out irrelevant information has proven critical for general individual differences in visual WM, other factors seem to be responsible for the age-related differences. We present data from a series of experiments suggesting that older adults are not generally impaired in filtering, but that efficient filtering is delayed. This delay even occurs when target selection is relatively easy. Moreover, it seems to be specific for older adults and was not observed in WM-equated younger adults. A detailed analysis of early visual potentials revealed that older and younger adults differed already during perceptual processing of targets and distractors. Older adults seem to be less focused on the targets. As a result, distractors may initially be encoded into WM and then need to be suppressed during the course of maintenance. This early age-specific filtering deficit is consistent with the view that in older adults proactive control over attentional settings is less efficient than in young adults.

## Emotional biographic information modulates face perception: An MEG study

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Previous electrophysiological studies revealed enhanced early and mid-latency emotional processing of multiple faces (conditioned stimuli, CS) which have previously been paired with aversive odors, sounds or electric shocks and thus with unconditioned stimuli (US) of intrinsic emotional value. As linguistic material gains its emotional connotation through learning, pairing of CS with linguistic US can be considered as second- or higher-order classical conditioning. Here we associated 60 neutral faces with different aversive (30) or neutral (30) spoken phrases of biographical linguistic information and measured neural processing of the CS-faces before and after learning by means of whole-head-magnetoencephalography (MEG). Faces with learned aversive connotation were rated as more arousing and more unpleasant compared to faces with neutral biographical associations and evoked stronger neural processing in early and mid-latency time intervals especially in left sensory and prefrontal cortex regions. Thus, classical conditionings of different orders result in similar behavioral and neural effects.

### Smooth criminal: Profound cognitive flexibility of convicted rule-breakers

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Previous research has consistently demonstrated that humans have a very strong tendency to adhere to rules even when they are arbitrary and conformity is not the objectively correct response option. Nevertheless, rule violation is a very common phenomenon, although the intensity and severity can range from trivial rule violations to rarer instances of habitual and severe rule-breaking behaviors. To date, there is a profound lack of understanding of the cognitive processes which occur during the act of rule violation and whether these processes may be associated with individual differences that may underlie this great interpersonal variability. Here, we attempted to tackle these questions by contrasting the performance of convicted rule-breakers (CRBs) and healthy controls (HCs) in an experimental setting. The task involved a stimulus-response-mapping rule which the participants were instructed to follow or to deliberately violate. In HCs, this violation was associated with a considerable deviation in the movement trajectories indicative of increased cognitive costs, while no similar effects were observed in CRBs. This is the first evidence of a possible cognitive marker underlying individual differences in social behavior indicating that habitual rule-breaking is associated with a cognitive “ease” to violate a rule at the most fundamental level of basic cognitive mechanisms.

## **Analyzing discrimination data of tone clusters with maximum likelihood fits**

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In the 20th century the already vast spectrum of musical chords used by composers up the romantic era was complemented by a new type of chord, the tone cluster, comprising many closely spaced tones with intervals of one or two semitones between them. Following to Henry Cowell, a leading cluster composer, clusters may be described by their width  $W$  (distance of lowest to highest tone) and their type (pentatonic, diatonic, chromatic) which translates to a kind of density  $D$  (notes per octave). A third parameter that can be derived from  $W$  and  $D$  is the total number of notes  $N$ . Listeners will not be able to reliably compare tones clusters based on these parameters without mistakes. It was the goal of the present study to develop a method for determining the region of indistinguishability around a standard tone cluster. We presented 1200 tone clusters in 400 three-intervals odd-one-out tasks to each of 15 listeners. We developed a maximum likelihood method to fit ellipsoids/ellipses of constant discriminability in the three-dimensional  $W/D/N$ -space as well as in the three two-dimensional subspaces. A likelihood ratio test revealed that the two-dimensional  $W/N$ -space is best to represent the discriminability of tone clusters.

## **Preparatory adoption of task-specific sets of visual attention—evidence from intermixed trials of a visual search task**

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To investigate cue-based preparation of task-specific sets of visual attention, participants frequently alternated between two tasks, associated with differential demands regarding stimulus selection. Specifically, symmetrical three-letter strings (in vertical format) were presented and participants either identified the central letter (i.e., Eriksen flanker task) or judged whether all letters of the string were identical (i.e., same-different task). The relevant task was indicated, on each trial, by a cue, presented at the outset of the trial. Visual attention was assessed by means of intermixing trials of a visual search task in which a prespecified target digit (accompanied by two other digits) occurred randomly in any of the three locations used for the presentation of letters in the letter tasks. Search task trials, presented after a cue that indicated the Eriksen flanker task displayed a more pronounced center-to-periphery gradient of search times, indicating the adoption of a narrower focus of visual attention, than search task trials presented after a cue that indicated the same-different task. These results demonstrate preparation of task-specific sets of visual attention on a trial-by-trial basis.

## **Age-dependent psychophysiological reflections of probabilistic adaptation**

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Confronting our volatile environment, we need to detect regularities and form predictions according to them. Deviation from these regularities results in a destabilization and an updating of prediction. Critically, deviations can be either persistent or temporary. When adapting our predictions, it is of crucial importance to take the likelihood of a change's persistence into consideration. We developed a new paradigm to investigate if behavioral and physiological responses to environmental change are modulated by the probability of the change's persistence. Subjects were asked to monitor a repeating five-digit sequence for changes of single digits, which could be either persistent or temporary. The probability for a change to last differed depending on the digit's ordinal position within the sequence. We collected behavioral data as well as skin conductance responses (SCR) of 20 young (21.6 yrs., 16♀) and 16 older (61.4 yrs., 7♀) participants. While change triggered typical signs of surprise, the probability of the change's persistence was found to modulate reaction times in the subsequent sequential run. Results further suggest that SCR is a sensitive measure of probability-dependent prediction. Furthermore, differences in reaction times, recognition measures, and SCR between young and older subjects reflect age-dependent characteristics of adaptation in a predictive setting.

## **I feel what I see. Overlap between affective and cognitive processing in the fear conditioned dual-stream RSVP task.**

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In the dual-stream rapid serial visual presentation (RSVP) task the accuracy of the identification of the first target (T1) is usually high, while the identification of the second target (T2) is impaired during the attentional blink (AB). However, when T2 appears in the left visual hemifield it is significantly better identified than when it appears in the right visual hemifield. This phenomenon is known as the left visual field advantage (LVFA). The right hemisphere, which is crucial for the LVFA, has been found to be important not only for attentional processes, but also for recognition of negative emotions. According to the model of Pessoa and Adolphs (2010) cognitive and affective processing overlaps by sharing same neural pathways. The present study aimed at investigating the effect of negative emotions on hemispheric asymmetry of visual processing. We applied the classical behavioral paradigm of fear conditioning. We measured skin conductance in the dual-stream RSVP task with some of the target letters being fear conditioned. We found comparable asymmetries for cognitive and affective processing. Additionally, the LVFA was stronger for emotionally loaded stimuli, which is further evidence of the right hemisphere advantage, not only for attentional, but also for emotional processing.

## **Cerebellar–parietal BOLD activity versus functional connectivity in simple and complex mental arithmetic**

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Cerebellar and parietal regions are co-activated by relatively complex tasks such as mental calculation (Arsalidou and Taylor 2011). However, the exact relationship between cerebellar and parietal regions during relatively complex tasks is unknown (Stoodley & Schmahmann, 2009). To this end, we examined the contribution of inferior parietal (IPL), IPS and superior cerebellar regions (I–IV, V, VI) to whole-brain activity in symbolic multiplication. fMRI data (TR=2s, 3x3x3 mm) was collected from 17 right-handed adults performing simple (e.g. 6x3) and complex (e.g. 12x6) symbolic multiplication. BOLD activity (GLM) and functional connectivity (Psychophysiological interactions, PPI) in complex versus simple multiplication was compared. PPI seed regions were defined from cytoarchitecturally distinct IPL and cerebellar subdivisions. Consistent with previous research, complex multiplication (complex > simple) was associated with bilateral parietal, frontal and cerebellar BOLD activation and IPL seed regions increased connectivity to parietal and frontal clusters. Interestingly, cerebellar seed regions decreased connectivity to parietal and frontal clusters in complex relative to simple multiplication (i.e. simple > complex). Parts of these de-coupled regions showed positive BOLD activation in complex multiplication. Thus, cerebellar–parietal de-coupling in complex tasks and/or coupling in simple, automated tasks may be an important feature of complexity-related networks. We speculate that de-coupling in complex tasks may occur due to increased attentional demands.

## **Unfallvermeidung durch visuelle Warnungen bei älteren Fahrern**

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Unfälle im Kreuzungsbereich sowie Unfälle im Längsverkehr machen fast die Hälfte (44%) aller Unfälle im innerstädtischen Bereich aus. Unfälle mit schwächeren Verkehrsteilnehmern fallen dabei aufgrund ihrer Unfallschwere besonders auf (26% aller tödlichen Unfälle), ebenso wie die häufige Beteiligung älterer Fahrer. Um derartige Unfälle und ihre Schwere zu reduzieren, werden im Rahmen des Projekts UR:BAN (gefördert durch das BmWi) auf Basis von Unfallanalysen Konzepte für warnende Fahrerassistenzsysteme in statischen Fahrsimulator der TU Braunschweig untersucht. Die grundlegende Frage ist dabei, ob ältere Fahrer von Warnungen profitieren und ob es je nach Warnart (Aufmerksamkeit lenken vs. Handlungen auslösen) Unterschiede gibt. Dazu wurde das Fahr- und Blickverhalten von 36 älteren Fahrern ab 65 Jahren in unterschiedlich kritischen urbanen Szenarien mit zwei Warnkonzepten und einer Kontrollgruppe in einem unabhängigen Versuchsplan. Da die älteren Fahrer insgesamt sehr wenige Kollisionen hatten, zeigte sich keine Verringerung der Kollisionen. Die Warnungen führten aber zu schnelleren Bremsreaktionen. Die stärkste Wirkung fand sich für eine unspezifische, handlungsauslösende Warnung („Stopp“). Gerade bei älteren Fahrern könnten diese Warnungen dazu beitragen, Unfälle zu vermeiden.

**Continuous and discrete-state modeling of confidence-rating ROCs:  
A critical test with minimal assumptions**

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An ongoing discussion in the recognition-memory literature concerns the question whether recognition judgments result from a direct mapping of graded memory representations or from a discrete-state representation with the possibility of complete information loss. These two accounts are usually evaluated by comparing their (penalized) fits to Receiver Operating Characteristic (ROC) data, a procedure that requires a series of auxiliary assumptions with the potential to distort results. We show that the two accounts can be compared on the basis of critical tests that hold under minimal assumptions. Using previously-published ROC data we show that confidence-rating judgments are consistent with a discrete-state account.

**Expecting no conflict – self-generated rather than cue-induced expectations  
lead to adaptation to lack of conflict**

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Expectations regarding future events can be used to prepare for action. Previous studies have shown that self-generated expectations (predictions) about an upcoming stimulus influence performance much more than cue induced expectations. However, a direct comparison between these two variants of expectation has been missing for expectation about an upcoming conflict level. In this study we tested how self-generated vs. cue-induced expectations about an upcoming conflict influence performance in a verbal Stroop task. This included assessing the influence of the previous trials on predictions and on the Stroop effect (sequential congruency effect; SCE) as well as expectation based modulations of the Stroop effect and the SCE based on RT. Only self-generated predictions showed significant modulating effects of the Stroop and SCE effects. Our data document better performance for one specific combination of task events: congruent trial accompanied by congruent prediction and conflict level repetition. Our results are in line with theories attributing conflict adaptation effects to the „adaption to the lack of conflict“. We discuss our results in a broader context of theories about conflict monitoring.

## **Saccades are faster when accompanied by motion toward the fovea**

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When observers make saccadic eye movements to a moving target, there is a pronounced directional asymmetry. Saccades to targets moving toward the fovea are slower than saccades to targets moving away from the fovea. The opposite effect is observed in perception: The perception of motion is better for targets moving towards the fovea than for targets moving away from it. Here, we measured saccadic reaction times to a target step from the fovea to the periphery. The foveal target was surrounded by a circular pattern that expanded or contracted. Contracting motion corresponds to motion toward the fovea whereas expanding motion corresponds to motion away from the fovea. Motion was irrelevant to the task and observers were instructed to ignore it. Saccadic reaction times were faster when the pattern was contracting than when it was expanding, which is consistent with studies on motion perception, but inconsistent with studies on saccadic eye movements. Attention is discussed as a possible cause of the effect.

## **Different neural signatures of compensatory and non-compensatory strategies during memory based decision making**

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Decisions can be made either with non-compensatory strategies that focus exclusively on specific attributes while ignoring others, or compensatory strategies that integrate across multiple attributes. In a previous study, Khader et al. (2011) found that when people use the non-compensatory take-the-best (TTB) strategy, neural activation in the left dorsolateral prefrontal cortex was higher the larger the number of retrieved attributes, accompanied by activation boosts in posterior brain areas supposedly storing the attribute information. Here, we tested the neural signatures of a compensatory strategy (i.e., "weighted-additive"; WADD), with a specific focus on brain areas that are specifically related to the requirement to trade-off between different attributes. Consistent with the claim that all attributes associated to the decision options should become activated and included into the decision when WADD is used, the selective activations in posterior and frontal areas found for TTB were completely absent. Instead, however, the requirement to calculate and compare weighted sums, which is specific to WADD, was found to elicit activation in the inferior parietal cortex. These findings contribute to a better understanding of the neural underpinnings of strategies in memory-based decision making and suggest that they can be dissociated based on their neural signatures.

## Can Self-Explanations foster Students' Performance in Experimental Concept Learning Tasks?

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Providing students with informative tutoring feedback (ITF) has proven to be beneficial for increasing students' performance in identifying conceptual rules (Narciss, 2004). To investigate the effects of ITF Narciss used Bruner's (1956) experimental concept formation tasks. The learner's task is to identify the conceptual rule using the available instances. Students who use both, positive and negative instances (complete strategy) outperform students who focus only on positive instances (incomplete strategy) (Bourne et al.1969). Based on these findings and on findings regarding the benefits of encouraging students to actively provide self-explanations during concept learning (e.g. Chi, 2008), this study aims at contributing empirical findings to the following research questions: (a) Do students who are encouraged to self-explain their incorrect hypothesis regarding conceptual rules use the complete strategy more frequently? (b) Does self-explaining incorrect hypotheses have an impact on concept learning performance? 79 university students (19 males, 60 females, age: 9–35years) were randomly assigned to one of two experimental conditions (knowledge of result-feedback + self-explanation vs. knowledge of result feedback). The results showed, that encouraging students to self-explain fosters the use of effective solutions strategies as well as performance in the concept learning tasks  $t(79) = 63.25$ ;  $p = 0.00$ ; effect size = 0.96.

## The power of words – Exploring the durability of instructed stimulus-response associations

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Responding to a stimulus in a specific task context leads to the formation of two distinct components of acquired stimulus-response associations: Stimulus-Action (S-A) and Stimulus-Classification (S-C) associations. For example, when participants are instructed to categorize stimuli as small or large by pressing a left or a right key, the stimulus "car" becomes associated with the category "large" and the action "right key-press". In a recent study on item-specific priming, we demonstrated that merely instructing S-A and S-C mappings leads to associative learning and influences later behavior. More specifically, we demonstrated that item-specific switches in S-A and S-C mappings between a prime and a later corresponding probe trial independently affected reaction time and accuracy both when participants acted upon prime stimuli as well as when participants were merely instructed about the correct action and classification associated with prime stimuli. In the present study, we elaborate on the durability of implemented and instructed S-A and S-C associations across several test trials/re-learning instances.

## Cognitive conflict in social dilemmas: An analysis of response dynamics

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Recently, it has been suggested that people are spontaneously inclined to cooperate in social dilemmas, whereas defection requires effortful deliberation. Based on this assumption, we hypothesized that defection entails more cognitive conflict than cooperation. To test this hypothesis, the current study presents a first application of the response dynamics paradigm to social dilemmas. In a fully incentivized lab experiment, mouse movements were tracked while participants repeatedly played simple two-person social dilemma games with two options (cooperation and defection). Within participants, the type of social dilemma was varied. Building on previous research, curvature of mouse movements was taken as an indicator of cognitive conflict. In line with the hypothesis of less cognitive conflict in cooperation, response trajectories were more curved (towards the non-chosen option) when individuals defected than when they cooperated. In other words, the cooperative option exerted more “pull” on mouse movements in case of defection than the non-cooperative option (defection) did in case of cooperation. This effect was robust across different types of social dilemmas and even occurred in the prisoner’s dilemma where defection was predominant on the choice level. Additionally, the effect was stronger for dispositional cooperators as measured by the Honesty–Humility factor of the HEXACO personality model.

### The effect of passive bystanders during the movement phase of tunnel evacuation – A virtual reality experiment on social influence

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Evacuation from tunnel fires is problematic since many tunnel users do not take appropriate protective actions. Social Influence (SI) has been identified as an important factor in evacuation. Especially passive behaviour of others may thwart evacuation. The present study tested if this effect increases if more passive bystanders are present during an emergency. Using a five sided CAVE system, two experimental groups (each n = 20) were immersed into a scenario with a virtual road tunnel fire. In one group, three passive virtual agents (VAs) were visible (low SI), in the other 15 passive VAs were visible (high SI). There were no group differences regarding destination choice (the number of participants moving to an emergency exit) and no differences between in pre-movement (the time participants waited before they started moving) and movement time (the time participants moved until they reached an exit). The results are compared to studies with a similar scenario but without a SI condition and scenarios with actively evacuating VAs. The results of the present study extend the findings of previous on SI studies on tunnel evacuation in virtual reality and contribute to a better understanding of evacuation from tunnel fire emergencies.

## **Impact of hand movements on visual depth and size perception**

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We examined whether and how the execution of hand movements affects the perceived size and depth of visual objects. Participants performed series of hand movement accompanied by apparent motions of target objects within two virtual tunnels. Subsequently, they judged the perceived size of those objects and the perceived depth of the tunnels. The results indicated that an increase in the range of hand motion increased the perceived depth of the tunnel and, simultaneously, decreased the perceived object's size. This outcome suggests that previously reported effects of motor variables on visual estimations of size and distance may have basically the same origin.

## **People matter: Perceived sender identity amplifies visual processing of socio-emotional language feedback**

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The personal significance of a language statement depends on its context, which is rarely taken account in neuroscience. Here, two studies are presented that investigate how the implied source of evaluative statements alters their processing. Participants' brain event-related potentials (ERPs) were recorded in response to word-streams consisting of positive, negative, and neutral trait adjectives, stated to either represent personal feedback from a human or to be generated by a computer. In experiment 1 the computer was portrayed as acting randomly, in experiment 2 it was portrayed as a socially intelligent system. Actually, feedback was always random. Both experiments revealed strong effects of perceived sender. In experiment 1, the notion of receiving feedback from a human amplified the early posterior negativity (EPN) and the Late Positive Potential (LPP). Likewise, emotional content enhanced the EPN and LPP. In experiment 2, EPN was modulated by emotional content only. However, P3a and LPP responded to both sender and content. Results show that perceiving a communicative partner as human amplifies visual processing. For humans, feedback by others is vital as belonging to a community reflects a strong motivational desire. This has robust repercussions even for processing single word messages in imaginary communicative contexts.

**Emotion sensitivity and task instruction affect brain activity  
and working memory performance for emotional faces**

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In two experiments we investigated how emotional face expression affects working memory. The first experiment tested whether individual sensitivity to emotional intensity relates to working memory performance and brain activity. Face expression (positive “happy”, negative “angry” and neutral faces) and set size (1, 2 and 3) were varied in a change detection task and the contralateral negative slow wave (CNSW) event-related potential was recorded to detect encoding and retention related brain activity (Klaver et al. Neurorep 1999, 65–8). No significant differences or interaction between performance and emotional face expression was found. However, emotional intensity (not valence) ratings for angry faces correlated with memory performance. The CNSW correlated with individual emotional intensity ratings for positive and negative faces expressions in high load conditions. A second experiment tested whether task instruction to detect changes in face identity, emotional face expression or both (conjunction) affected the processing of face expression in working memory. We found that changes in face identity were better detected than changes in expression, but that attention to face expression enhanced the CNSW during encoding. The results emphasize the importance of emotion sensitivity and task driven attention in predicting brain activity and individual working memory performance for emotional faces.

**Fearful face stimuli and film induced fear show similar – but not multiplicative – effects on  
duration perception**

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The duration of fearful face stimuli is overestimated in comparison to neutral face stimuli (e.g. Gil & Droit-Volet, 2012). This overestimation was found to be moderated by individual differences in negative emotionality between participants (trait fearfulness; Tipples, 2008; 2011). Based on this, we assumed that state fearfulness might evoke a similar moderating effect. In order to explore this hypothesis, neutral and fearful mood was induced by appropriate film clips before participants rated the duration of neutral and fearful faces in a classic bisection task. Higher levels of skin conductance during the “fearful” compared to the “neutral” state condition indicated that the intended induction of mood states was successful. Moreover, our results replicate the prolonged temporal perception of fearful compared to neutral faces. They further show that state fear also prolongs duration ratings. However, we did not find a significant interaction between stimulus type and mood state indicating that the effects are not multiplicative. This outcome is discussed in regards of current models of time perception.

## **Processing Capacity in Multiple Sclerosis: Alterations of test performance as a result of cognitive Fatigue in TVA-based assessment of visual attention**

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Multiple sclerosis (MS) is a diffusely disseminated inflammatory disease affecting widespread cerebral networks. Major cognitive impairments are a reduction of processing capacity and mental fatigue, i.e. an “abnormal sense of tiredness or lack of energy”. In the present study, we assessed the relationship between fatigue and different aspects of processing capacity, as assessed based on a ‘theory of visual attention’ (TVA, Bundesen 1990, 2013). The performance of 36 relapsing–remitting MS patients in a whole report task was compared to healthy control subjects matched for sex, age, and education. The sustained attention test PASAT–3 served as a measure of objective fatigue, and the self–report questionnaire MFIS as a measure of subjective fatigue. Results show that processing speed performance for MS patients compared to healthy controls declines in the second half of the TVA test and in particular for patients with high vs low objective fatigue. These results suggest that fatigue affects a specific aspect of processing capacity. However, further research is required to elucidate the complex relations of sustained attention and fatigue.

## **When virtual contact is all you need: Subtle reminders of Facebook preempt social–contact restoration after exclusion**

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Activating thoughts about one's social connectedness through Facebook can preempt social–contact restoration after social exclusion. In Study I, participants were either excluded or included in Cyberball, a virtual ball–tossing game. Afterwards, a Facebook icon or a control icon (Flash Player) was shown on the margin of a computer screen while participants worked on a filler task. In the control condition, excluded (vs. included) participants subsequently expressed greater interest in social contact (in real–world and virtual online settings). This response to exclusion was absent after the subtle exposure to the Facebook icon. The effect of icon presentation was moderated by relational Facebook use: The interest in further social contact after exclusion was particularly low in participants who reported employing Facebook to maintain relationships and social contacts to a greater (vs. lower) extent. Study II mainly replicated the findings while using a different control icon (Word) with the same color as the Facebook icon. Additionally, a moderation by horizontal collectivism was found: The interest in further social contact was especially low for participants who reported higher (vs. lower) collectivism. These findings suggest that being reminded of one's connectedness through an online social network can fill the social void resulting from exclusion.

## Emotional facial priming of semantic interpretation and thematic role assignment

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Rapid effects of emotional cues have been shown in research on both visual perception and language processing. For language processing, most studies have focused on how valence and arousal from verbal cues affects the comprehension process. I will present recent research that speaks to how comprehenders integrate emotional cues from a non-linguistic context and from unfolding utterances, and I will argue that while emotional facial expressions can rapidly modulate our visual attention during semantic interpretation, their effects on thematic role assignment appear less robust.

## Shifts in cue modality exert contextual modulation of response-repetition effects in task switching

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Task switching studies revealed that the usual response-repetition benefit is abolished and often reversed if the task context changes. According to one account, responses are inhibited after execution, which would actually result in a repetition cost, but this can be observed only in task switches, whereas this inhibitory response priming is overcompensated by positive stimulus or category priming in task repetitions. According to another account, performing a response strengthens a binding between response and stimulus (or stimulus category) in a specific task context, leading to a repetition benefit in task repetitions, whereas this binding leads to interference in task switches. In the present study, we introduced a contextual manipulation of retrieval context by varying cue modality (visual vs. auditory) in switching between two numerical judgment tasks. We found better performance with repeated cue modality specifically if the task repeated, too. Critically, the response-repetition benefit was substantially reduced with changed cue modality, whereas the observed response-repetition costs in task switches remained unaffected by this contextual change. While it is unclear how the response-inhibition account could explain the modulation of the response-repetition benefit based on changed cue-modality, the data pattern is readily explained by the binding account.

## **Der Einfluss strategischer Prozesse auf die Verarbeitung der Blickrichtung im Basketball: Eine EKP-Studie**

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Das Blickverhalten des Menschen ist ein wichtiger sozialer Hinweisreiz und kann, z.B. im Sport, besonders im Basketball als Ablenkung (Finte) genutzt werden. In dieser Studie werden die ereigniskorrelierten Potenziale (EKPs) der automatischen Verarbeitung von Blick- und Passrichtung im Basketball sowie die strategische Unterdrückung der Blickverarbeitung erforscht. Dreißig Versuchspersonen (VPs) nahmen an einem unterschweligen Primingexperiment teil, in dem Blick- und Passrichtung zwischen Prime und Targetbild manipuliert wurden (beide kongruent-inkongruent), wobei immer die Passrichtung beurteilt werden sollte. In einem Block zeigten alle Targetbilder eine Blicktäuschung, so dass die optimale Aufgabenbearbeitung möglichst die Blickrichtung unterdrücken sollte. Im zweiten Block waren Blick und Pass immer kongruent, eine Unterdrückung der Blickrichtung somit nicht hilfreich. Sowohl die Verhaltensdaten als auch die EKP-Daten weisen auf ein qualitativ verschiedenes Ergebnismuster in den beiden Blöcken hin. Während die Reaktionszeiten in beiden Blöcken einen Haupteffekt der Passkongruenz zeigen, findet sich ein Haupteffekt der Blickkongruenz nur im Block ohne Blicktäuschung. Die vorläufigen EKPs zeigen eine Modulation der N2-Komponente nur im Block ohne Blicktäuschung und unterschiedliche Modulationen der P3-Komponente in beiden Blöcken. Anscheinend lässt sich eine automatische Hemmung der Blickverarbeitung (N2-Komponente) von einer strategischen Blickverarbeitungshemmung unterscheiden; die Targetbildbeurteilung (P3-Komponente) spiegelt ebenfalls strategische Verarbeitungseinflüsse wider.

## **Wirkung von Furchtappellen in der Werbung**

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Um VerkehrsteilnehmerInnen für das Thema Sicherheit im Straßenverkehr zu sensibilisieren, werden „Awareness“-Kampagnendurchgeführt. Eine massenmediale Möglichkeit hierfür ist die furchtinduzierende Werbung. Furchtappelle sollen die RezipientInnen dazu animieren, ihre eigenen Wertvorstellungen zu analysieren und gegebenenfalls ihre Einstellung und ihr Verhalten anzupassen. Studien zu diesem Themenbereich lieferten meist sehr heterogene Ergebnisse (vgl. Roger & Mewborn 1976; Ruiter, Abraham & Kok 2001). In der vorliegenden Studie (N=206) wurde, wie in früheren Studien, davon ausgegangen, dass ein höherer Furchtappell eher die Annahme einer Verhaltensempfehlung bewirkt, als ein geringer. Zudem wurde erhoben, ob ein Zusammenhang zwischen den Variablen „Appellstärke“ und „Furcht“ besteht und dies in Relation mit der allgemeinen Ängstlichkeit und dem Selbstwert der ProbandInnen gestellt. Zu diesem Zweck wurde ein Onlinefragebogen erstellt, der die genannten Faktoren erhob und den Testpersonen entweder eine „Schock-Werbung“, eine Werbung mit niedrigem Furchtappell oder kein Video (Kontrollgruppe) präsentiert. Die Analyse zeigte, dass die „Schock-Werbung“ zwar als unangenehm und belastender empfunden wurde, jedoch zu keinen signifikant unterschiedlichen Verhaltensabsichten führte. Im Extremgruppenvergleich zeigte sich allerdings eine Interaktion zwischen dem Selbstwert der RezipientInnen und der Furchtappell-Höhe. Bei Personen mit niedrigem Selbstwert führte die „Schock-Werbung“ eher zu verantwortungsbewusstem Fahrverhalten als der Spot mit niedrigem Furchtappell.

## **A lateralized ERP index for the encoding of verbal material in the left hemisphere**

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Left–lateralization of language processing in the brain is a well–known phenomenon that has been extensively investigated with neuroimaging studies. Interestingly there is little research regarding lateralized posterior event–related potentials (ERPs) of language processing. To investigate possible lateralized ERPs in single–word processing, a within study design with the factors attention (high/low) and material (rare and frequent words, pronounceable non–words and password–like alphanumerical–strings) was realized in a simple recognition task. Differences for material and attention were expected in terms of increased posterior left–lateralized ERPs for word stimuli compared to non–words and passwords and for attended compared to unattended stimuli. An interaction was predicted due to a larger attention effect for word stimuli compared to non–words and passwords. Results suggest a parieto–occipital left–lateralized negative component (150–270 ms) for all stimuli except passwords. This component was significantly enhanced for attended compared to unattended stimuli. However, this attention effect was only present in word–stimuli and, moreover, significantly more pronounced than in non–words and passwords. The component is discussed in the light of earlier findings as a lateralized ERP index for the encoding of visual verbal material in the left hemisphere. The process reflected in this component might facilitate subsequent processes of semantic retrieval.

## **Conflict broadens attention**

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Cognitive conflict, for example in the Stroop task, leads to automatic conflict adaptation (Botvinick et al., 2001). Subsequent reactions in conflict situations are influenced by previous conflicts; and sometimes conflict adaptation even occurs if the tasks are different (e.g., Kan et al., 2013). We expand on this research by showing that conflict adaptation extends to breadth of perceptual processing. Using different versions of the Stroop task and measuring reaction times for global and local Navon stimuli, we found that conflict trials (relative to non–conflict trials) lead to more global processing. We observed this pattern both when participants performed the Stroop task and when they passively watched congruent and incongruent Stroop stimuli without reacting. Thus, experiencing conflict leads to a more global attentional orientation.

## **On the processing of facial expressions: Evidence for an automatic authenticity check**

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For several decades emotion researchers have been studying the mechanisms behind the processing of facial expressions. A rather prominent research question is the following: Which stimulus features can be processed automatically even without conscious awareness? There is a vast body of literature showing that the valence of a wide variety of emotional stimuli can be extracted rapidly. Typically, this automatic evaluation process is discussed as a mechanism that prepares the organism to respond properly to significant stimuli in the environment. However, facial expressions as stimuli have one specific characteristic: They can be produced voluntarily (= simulated expressions) or involuntarily (= authentic expressions). Automatic processing of the authenticity of facial expressions can be considered as beneficial for survival. We tested whether the authenticity of facial expressions can be extracted automatically during stimulus processing. Using a priming paradigm we present first evidence showing that authentic emotional expressions can be differentiated from simulated ones.

## **The role of the genetic polymorphism of catechol-O-methyltransferase in performing and learning motor tasks**

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The enzyme catechol-O-methyltransferase (COMT) influences the dopamine availability in the synaptic clefts especially in prefrontal brain regions. Its enzymatic activity is associated with three different genotypes, which influence prefrontal dopamine levels and therefore executive functions (Witte & Flöel, 2012). There is evidence for the influence of COMT-genotype on motor control with regard to sequence production, visuomotor adaptation (Noohi et al., 2014), and positioning tasks (Lage et al., 2014). In addition we found first evidence for effects of COMT-genotype on long term-retention of motor skills (Krause et al., 2014). We examined if dual-task cost reductions (as an indicator of motor automatization) in a set of behavioral data are related to the COMT-polymorphisms of the 22 subjects who practiced an elbow-extension-flexion-sequence with 3 movement reversals in different practice settings with terminal feedback for each reversal. They volunteered for a DNA-analysis to determine the COMT-genotype. As supposed, the number of COMT-genotype met-alleles is positively correlated with dual-task cost reductions (interpreted as automatization). Future studies should replicate this effect and examine the influence of additional polymorphisms of dopaminergic enzymes (e.g. DAT).

## **Early motor memory consolidation: Modulation by non-invasive transcranial alternating and direct current stimulation**

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The primary motor cortex (M1) is crucial for motor learning and early motor memory consolidation. Transcranial alternating current stimulation (tACS) represents a non-invasive tool for frequency-specific modulation of brain oscillations. Since the functional role of motor-cortical alpha (8–12 Hz) and beta (13–30 Hz) oscillations for motor consolidation remains to be solved, we applied to the left M1 alpha (10 Hz) vs. beta (20 Hz) vs. sham tACS in 36 right-handed participants. In addition, we applied anodal vs. cathodal transcranial direct current stimulation (tDCS) in 30 participants to test whether tACS effects were associated with altered motor-cortical excitability. Participants learned a serial reaction time task (sequential vs. random) with the right hand. Immediately after learning i.e. during early consolidation, tACS was applied at rest for ten minutes. Reaction times were measured at baseline, acquisition and retrieval immediately after stimulation. Retrieval was characterized by faster reaction times independent of stimulation frequency. 20 Hz tACS yielded a larger benefit on retrieval compared to 10 Hz and sham tACS. Anodal and cathodal tDCS were also associated with faster reaction times most likely reflecting an unspecific effect. The present data support the hypothesis that altered motor-cortical beta oscillations might represent functional reorganization following motor learning.

## **Source memory for memories of mental imagery: subject, item and condition effects**

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The present research project aims to examine the source monitoring process by using the example of mental imagery and visual perception. Source monitoring is a sequential decision process needed to attribute the source of a memory. It consists of the following subprocesses: item memory and source memory. It is hypothesized that the accuracy of source memory is decreased by the similarity of the sources (Johnson, Hashtroudi & Lindsay, 1993). The similarity between the source imagery and the source visual perception is influenced by the ease of the imagery process (Finke, Johnson & Shyi, 1988). Whereas the accuracy of item memory is decreased by the similarity of the items (Bayen, Murnane & Erdfelder, 1996). The stimuli's deviances from the mean color of the stimuli influences item similarity in the following experiments. These experiments add to the current research by contributing the following four main aspects. Source and item similarity are directly manipulated on continuous scales, instead of comparing groups of stimuli. Imagery is experimentally discriminable from refreshing in visual working memory. Furthermore, imagery and refreshing must not be directly instructed, but are inherent to the conditions of the tasks. Finally, analysis and interpretations based on two different hierarchical Bayesian models, multinomial processing tree models and drift diffusion models, are compared.

## **Inattentional blindness is influenced by exposure time not motion speed**

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Inattentional blindness is a striking phenomenon in which a salient object within the visual field goes unnoticed because it is unexpected and attention is focused elsewhere. Several attributes of the unexpected object, such as its size and animacy, have been shown to influence the probability of inattentional blindness. At present it is unclear whether or how the speed of a moving unexpected object influences inattentional blindness. If a fast-moving unexpected object is more salient, then inattentional blindness rates should decrease. On the other hand, it seems feasible that a slower unexpected object might decrease inattentional blindness as the object is present in the visual field for longer. In three experiments with a total of 300 participants we demonstrated that inattentional-blindness rates are considerably lower if the unexpected object moves more slowly, suggesting that it is the mere exposure time of the unexpected object rather than its motion speed that determines the likelihood of its detection. Alternative explanations could be ruled out: The effect is not based on a pop-out effect arising from different motion speeds in relation to the primary-task stimuli (Study 2), nor is it based on a higher saliency of slow-moving unexpected objects (Study 3).

## **Task inhibition across stimulus modalities**

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Inhibition as a component of selective attention was investigated across stimulus modalities using a cued-task-switching paradigm. Participants were asked to judge number words (1 to 9 without 5) with respect to their relative magnitude to the standard 5 (magnitude task), their parity (parity task) or their distance to the standard 5 (interval task). We assessed task inhibition as  $n-2$  repetition costs (i.e., worse performance in task sequences of ABA relative to CBA type). We compared these costs between blocked unimodal visual and auditory stimulus conditions (and between two preparation intervals). In the visual condition, a bar on different screen height levels served as a cue and, similarly, a differently pitched sound in the auditory condition. The cue stimulus interval (CSI) of either 300 or 1000 ms was varied randomly. We found a preparation effect of equal size between the two modalities. More importantly, the inhibition effect was observed for both modalities. Results are discussed with respect to a model of attentional resources and a modality weighting account.

## Effects of gaze direction on perceived trustworthiness

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Directed eye gaze is an important non-verbal communication channel, providing useful information in social interactions (Emery, 2000; Jones, DeBruine, Little, Conway, & Feinberg, 2006; Frischen, Bayliss, & Tipper, 2007). The present study investigated whether direct eye gaze of a speaker affects the likelihood of listeners believing a truth-ambiguous statement. Participants were presented with videos in which a speaker produced thirty-six such statements with direct or averted gaze (e.g., “sniffer dogs cannot smell the difference between monozygotic twins”). They responded using a four-point scale (“definitely not true”, “probably not true”, “probably true”, “definitely true”). The statements were selected from a rating study to ensure that our student participants were unlikely to know a-priori whether they were true or not. Indeed, participants were significantly more likely to believe statements when the speaker looked at them directly (57 %) than when she averted her gaze (42 %;  $p < .001$ ). Interestingly, while they were generally slower to respond in the direct gaze condition than for averted gaze, they were particularly slow to disagree with a statement uttered with direct gaze ( $p < .05$ ), suggesting that direct gaze rendered statements more believable.

## Is personal relevance an important aspect for cheater detection?

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Evolutionary psychologists often claim that memory functions can only be understood through an analysis of the specific selection pressures that have shaped the cognitive system during human evolution. In line with this framework, a number of studies have shown a source memory advantage for faces of cheaters over faces of non-cheaters. This can be beneficial for cooperative individuals because remembering that a face belongs to a cheater can help to avoid being exploited by this person in future encounters. In one study, we were interested in whether our student participants were able to discriminate between behavior descriptions which had a high probability to happen to them during the next few years and behavior descriptions which had a low probability to happen to them during the next few years. A multinomial processing tree model was used to disentangle old-new discrimination and source memory for cheating, altruistic and neutral behavior descriptions. The results showed that source memory was enhanced for faces combined with negative trait information which was relevant for students. In another study, we looked if cheating game partners can be remembered in a later source memory test. Interestingly, this was not the case.

## **Are children's perceptual decisions susceptible to social influence?**

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The opinions of others have a profound influence on our decision-making. Here, we investigate the effect of social context on perceptual decisions in children at different developmental stages. 6–8 and 12–14 year-olds judged the rotational direction of a structure-from-motion cylinder presented on a screen. Rotation was defined by binocular depth, which was systematically altered to obtain psychometric functions. Immediately before stimulus presentation, one age- and gender-matched peer provided 'advice' about the stimulus' rotational direction ('left' or 'right') via a video clip. 'Advice' was correct (66.7% of trials) or incorrect (33.3%), pseudo-randomly interleaved. On trials with ambiguous stimuli, advice was 50% 'left', 50% 'right'. The younger age group showed little effect of advice on perceptual judgements: the pooled psychometric data for advice 'left' and 'right' were equally well-fit with one cumulative Gaussian as with two separate functions (F-test,  $p=0.891$ ,  $n=19$ ). In contrast, for 12–14 year-olds, social influence consistently shifted perceptual judgements in the direction indicated by the advisor (F-test,  $p<0.0001$ ,  $n=30$ ). While social effects were seen across different stimulus strengths, they were stronger for ambiguous stimuli (Wilcoxon Rank Sum,  $p<0.0001$ ). Social context also affected reaction times. Our results suggest that children at 6–8 years show little susceptibility to social influence and that the effect of social influence increases with age.

## **Wahrnehmung oder Aufmerksamkeit als Maß visueller Salienz?**

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Visuelle Salienz entsteht durch lokale Unterschiede innerhalb Dimensionen visueller Eigenschaften, wie zum Beispiel Helligkeits- oder Orientierungskontrast. Weist ein Reiz Eigenschaften aus unterschiedlichen Dimensionen auf, so werden sie zu einem allgemeinen Salienzmaß verrechnet. Diese Ansicht schlägt sich in vielen Salienzmodellen nieder. Salienz wird in Studien unterschiedlich operationalisiert: Entweder durch Wahrnehmung der Salienz, wie etwa beim Vergleich zweier Reize, oder durch exogene Aufmerksamkeitsausrichtung, die sich zum Beispiel in einer Dotprobe-Aufgabe erfassen lässt. Aktuelle Forschungsergebnisse zeigen, dass Salienzeffekte, die durch Aufmerksamkeitsausrichtung gemessen werden, einem zeitlichen Verlauf folgen. Dies widerspricht der Alltagserfahrung, dass auffällige Reize in einer Szene auffällig bleiben. In Experimenten, in denen die Probanden beliebig viel Zeit für eine Bewertung von Reizen haben, kann kein zeitlicher Verlauf erfasst werden. Salienzeffekte, die durch Bewertungen gemessen werden, zeigen sich auch über die zeitlichen Grenzen von Salienzeffekten, die durch Aufmerksamkeitsausrichtung gemessen werden, hinaus. Obwohl Salienzbewertungen endogene Einflüsse beinhalten können, geben sie wieder, was als auffällig wahrgenommen wird. Dieser Beitrag diskutiert, welche der zwei Operationalisierungsarten für Studien zu einem allgemeinen Salienzmaß besser geeignet ist.

## **Transcranial magnetic stimulation in dual-task situations – The role of the inferior frontal junction in task-order coordination.**

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A crucial limitation of the cognitive system can be shown in dual-task situations in which performance is decreased (e.g. longer reaction times, more errors) compared to situations in which tasks are executed separately. Dual-task costs arise due to a capacity limited structure that induces a serial processing of the competing task streams and requires additional cognitive control for coordinating task-order. Imaging studies give rise to the assumption that the lateral prefrontal cortex (LPFC) is essential for implementing those control processes. In the present study, we provide additional evidence for the causal involvement of the LPFC in dual-task situations using transcranial magnetic stimulation (TMS). Participants performed a dual-task of the Psychological Refractory Period (PRP) paradigm consisting of an auditory and a visual task. We manipulated the demands on task-order control in blocks with fixed and random order of the two tasks. The effects of stimulation over the inferior frontal junction compared to two control conditions were examined. In the stimulation condition we found a higher proportion of order errors, and prolonged reaction times for the second task with increasing demands on task-order coordination. These results support the conclusion that the LPFC is involved in task-order coordination in dual-task situations.

## **Mentalizing (but not Mirroring) Network Explains Judgment of Nonverbal Expressions of Confidence**

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The confidence with which a person speaks carries important information on how to evaluate and respond to what is being said. A speaker's confidence is commonly displayed in nonverbal visual cues, such as their eye gaze pattern or facial expression. In this functional magnetic resonance imaging (fMRI) study we investigate how the human brain forms judgments about another person's knowledge based on nonverbal cues. While in the scanner, participants (N=18) viewed short videos of people answering general knowledge questions, and judged each respondent's confidence in their answer. A parametric analysis approach allowed us to specify the role of two neural networks associated with social inference making, the mentalizing and the mirroring network: While areas of both networks are active when processing the nonverbal cues of another person's confidence, only activity in the mentalizing network is modulated by the outcome of this judgment. Our data support an integrative account of the mentalizing and mirroring network, in which the two networks work together, yet serve dissociable functions.

## **Loud = Better! Metacognitive Illusions about Volume Transfer to Source Memory and Bias Source Attributions**

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Although presentation volume does not affect memory people believe that they will remember words presented in a loud volume better than words presented in a quiet volume (e.g., Rhodes & Castel, 2009). The present study assessed whether this volume-related metacognitive illusion about item memory transfers to source memory (e.g., memory for the speaker's gender). Participants heard words in a male or female voice in loud or quiet volume and made Judgments of Learning (JOLs; probability of remembering the word) and Judgments of Source (JOSs; probability of remembering the volume and the speaker's gender). Neither item nor source memory was affected by volume but participants gave higher JOLs and JOSs for loud than for quiet words. Multinomial model-based analyses revealed that participants based their source guessing in a following source-monitoring test on these false metacognitive beliefs (cf. Kuhlmann & Touron, 2011; Meiser, Sattler & von Hecker, 2007): When they could not remember the source of a word, they were biased to guess that it was presented in a quiet volume, resulting in overall more correct source attributions for quiet than for loud words. That is, this metacognitive illusion biased participants' source-attribution performance in the opposite direction to what they had predicted.

## **Pupillary Evidence for Post-Error Slowing after Correct Trials**

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After making an error, participants slow down on subsequent decisions. This post-error slowing effect (PSE) is often explained as an adjustment of response caution. To distinguish PSE from feedback effects, no feedback is given in most PSE experiments. However, it is unclear whether participants have to be aware of making an error for the PSE to occur. Also, it is unclear whether the effect is purely a response to an evaluation of an incorrect response or whether it also occurs when a response is difficult, yet correct. To answer these questions, we ran a lexical decision experiment with words and pseudo-words (fake-words conforming to the orthographic rules of German) as target trials, embedded within filler words and non-words. We assessed response times and pupil dilation. A reliable PSE was observed in response to incorrect responses. As expected, the pseudo-words elicited a larger pupillary response than the words, and incorrect responses resulted in more dilation than correct responses. Interestingly, the pupillary response to pseudo-words in both error and correct trials is correlated with the RT on subsequent trials, indicating that participants adjust their response caution when they realize that a trial was difficult, even if the response itself was correct.

## **Neuronal mechanisms of visual attention: A nonverbal measure combining eye-tracking and EEG**

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Eye-tracking allows fine-grained assessment of fixation positions and saccades in healthy adults, clinical populations and infants. It is therefore a useful tool to investigate overt attention. However, previous attention paradigms that have been used in combination with neurological measures, involved button presses and therefore required verbal instructions of subjects. In this study we combined eye-tracking and EEG to develop a method for testing brain mechanisms of attention in infants and other non-verbal populations. We recorded ERPs in 24 healthy adults while they completed a manual attention task compared to an eye-movement task. Pre-saccadic ERP components were similar in both tasks, indicating that the underlying attention components are comparable. We then used a combination of eye-tracking and EEG to investigate the brain mechanisms involved in attention development in 70 young infants and 24 adults, measured in a well-established paradigm for measuring shifts of attention (Fixation Shift Paradigm). Our results suggest that the cortical brain mechanisms involved in attention shifts change significantly within the first year of life and can successfully be monitored using this method. The research shows that combining eye-tracking and EEG can be a valid method to relate behaviour to brain mechanisms in adults and non-verbal subjects.

## **Asymmetric transfer effects between cognitive and affective task disturbances**

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Task-irrelevant features of a stimulus can disturb performance on a given task, and this can occur for cognitive reasons such as irrelevant stimulus position, and affective reasons such as high stimulus valence. Humans adapt to such disturbances in order to ensure successful task performance. Adaptations can occur in a transient manner in response to recent events, and they can also be sustained to account for overall probabilities of disturbances. Here, we study the mutual interplay between affective and cognitive task disturbances under conditions of sustained conflict adaptation. More precisely, we examined the trajectory of finger movements in a speeded classification task and investigated whether adaptation to a high probability of spatial disturbances transfers to the impact of affective disturbances (Experiment 1) and whether adaptation to a high probability of affective disturbances transfers to the impact of spatial disturbances (Experiment 2). Our observations point toward an asymmetric transfer from affect-based adaptations to the regulation of cognitive disturbances, but not the other way around.

## Electrophysiological Correlates of Task Switching under Uncertainty

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Advance task preparation in task switching is considered a hallmark of cognitive control. Task preparation involves dissociable cognitive component processes, i.e., strategy-dependent and strategy-independent control processes that have been linked to early and late parietally distributed positive event-related potentials, respectively (De Baene & Brass, 2014). We report results obtained from a three-rule, transition-cuing task-switching study in which we manipulated the conditional probability of the two remaining rules being correct when participants (N=18) switched away from the third rule. In high-uncertainty conditions, both viable rules were equally likely (50%/50%) whereas in low-uncertainty conditions, one rule was more likely than the other (70%/30%). Importantly, incorrect rule guesses on switch trials necessitated additional rule switching in the following trials (addendum switching). We found that responses on addendum switch trials were substantially slower and less accurate in low-uncertainty than in high-uncertainty conditions. Cues signaling the need for addendum switching evoked more positive late (but not early) parietal potentials in low-uncertainty as compared to high-uncertainty conditions. These data indicate that the late parietal positivity in task-switching paradigms is sensitive to the local probabilistic context of task succession, and that it should thus be regarded as being strategy-dependent.

## Subjective arousal state affects temporal preparation for speeded action:

### An individual differences approach

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Two experiments will be reported that investigated the relationship between temporal preparation for speeded action and subjective arousal state related to feelings of energy (“energetic arousal”, EA), which is thought to reflect attentional resource availability. In the first experiment, a constant-foreperiod (FP) design was used to induce high (after short FPs) versus low (after long FPs) degrees of temporal preparation. Performance after short FPs was found to be unaffected by the reported level of pre-task EA, while after long FPs, high-EA participants suffered significantly less from reduced temporal preparation than did low-EA participants. Thus, suboptimal temporal preparation due to increased time uncertainty after long FPs was partially offset by high levels of perceived energetic arousal. The second experiment, using a variable-FP paradigm to induce high (after long FPs) versus low (after short FPs) degrees of temporal preparation, basically replicated these findings. Collectively, our results suggest that self-reported high EA facilitates top-down preparation not directly but rather indirectly by supporting basic processes that maintain the general responsiveness of the individual.

**Impaired strategic decision making under stress:  
Identifying two routes stress hinders strategic decision making**

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In a previous lab-based experiment we found that stress impaired strategic decision making (Leder, Häusser & Mojzisch, 2013). We carried out a second experiment to validate this finding using a real life stressor and to identify the mechanisms by which stress impedes strategizing. Here, we induced stress with a quasi-experimental manipulation: one group was invited to participate in a beauty contest game before an exam, the other group before a lecture. Furthermore, participants were randomly assigned to one of two conditions: (a) participants had to write down their assumptions about the other players' behavior, and (b) a control condition with no such instruction. This resulted in 2x2 quasi-experimental between subjects design. Results revealed that participants in the stress group showed impaired strategic reasoning. Analyses of the underlying mechanisms revealed that two distinct processes were involved in producing this impairment: first, a lack of understanding the underlying mathematical mechanism of the game, and, second, the inability to use beliefs about others when forming one's own best response. Thus, the findings of our lab-based experiment were validated in "the wild" and we found evidence for two underlying mechanisms leading to impaired strategic decision making under stress.

**Test-Retest Reliability of the Parameters of the Ratcliff Diffusion Model**

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In decision response tasks, often either mean response times or the percentage of correct responses are analyzed. In contrast, the Ratcliff diffusion model (1978) allows to disentangle diverse cognitive components involved in binary decision tasks (e.g., response criteria, speed of accumulation of information). Diffusion model parameter estimation uses the shape of response time distributions as well as error rates. If these parameters are to be used as measures of interindividual differences, their reliability is of crucial importance. We analyzed the test-retest reliability of the parameters of the Ratcliff diffusion model for two experimental paradigms: a lexical decision task and a recognition memory task. Often, the diffusion model is applied to studies with very high trial numbers (> 1000). The necessity of these high trial numbers has rarely been questioned. To address this question, we compare test-retest reliability coefficients for different trial numbers.

## Spatial memory in the horizontal and vertical plane

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While people frequently change perspectives around the ground plane, they less do so around the vertical plane. We investigated whether this difference in interacting with the environment affects spatial memories for different planes. In Experiment 1, participants memorized locations of colored tags on either a horizontal or a vertical board in a virtual room, and then relocated them to their original location from different perspectives (via rotating the board). Surprisingly, relocation was quicker and more accurate for the vertical than for the horizontal plane when spatial memory was accessed from the learning perspective or novel perspectives orthogonal to it. Therefore, spatial memory represented along vertical upright orientation can be better than that encoded with a front orientation. In Experiment 2, we rotated both the board and the whole virtual room to simulate the perspective change caused by observer's movement. Performance decreased with increasing disparity between learning and test perspectives for the vertical plane but less so for the horizontal plane. Moreover, performance was clearly better when the room rotated with the board than not, suggesting that spatial locations were also represented with environmental frames of reference. These results demonstrate that spatial memories for horizontal and vertical planes are qualitatively different.

## „Hör auf mich!“ – Sprachwarnungen in Unfallsituationen

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Mit der zunehmend älter werdenden Bevölkerung in Deutschland werden zukünftig auch die Zahlen älterer Verkehrsteilnehmer, vor allem im automobilen Straßenverkehr, ansteigen. Studien belegen bereits jetzt, dass ältere Autofahrer in komplexen, innerstädtischen Situationen wie beispielsweise Kreuzungen zu einer erhöhten Unfallzahl neigen. Untersuchungen zufolge lässt sich dieses erhöhte Risiko auf altersbedingte Veränderungen der Informationsverarbeitung in den Bereichen Wahrnehmung und Aufmerksamkeit zurückführen. Unterstützung bieten hier moderne Assistenzsysteme, die den Fahrer vor Gefahren warnen sollen. Allerdings nutzt eine Vielzahl solcher Assistenzsysteme bislang sehr stark den visuellen Kanal um Informationen an den Fahrer zu übermitteln. Da die visuelle Aufnahmefähigkeit älterer Autofahrer besonders in komplexen Situationen stark an ihre Grenzen gerät, wird in dem Projekt SPRICH („Sprache als Medium der Mensch-Technik-Interaktion bei älteren Fahrern“, gefördert vom BmBF) in einer ersten Fahrsimulatorstudie ein auf Sprache basierendes Warnsystem getestet und mit aktuellen Systemen in seiner Wirksamkeit verglichen. Vorteile bei der Verwendung von Sprache als Warnung sind zum einen, dass sie allgemein verständlich ist und nicht erst erlernt werden muss und zum anderen, dass sie es dem Fahrer ermöglicht, Informationen aufzunehmen ohne dabei den Blick vom Verkehrsgeschehen abwenden zu müssen. Für die Untersuchung wurden in einem Vorversuch geeignete Warnworte eruiert und im Fahrsimulator der TU Braunschweig integriert. Das sprachliche Warnsystem wurde anschließend in vier unterschiedlich komplexen, urbanen Situationen gegenüber (1) einer Bedingung ohne Warnung, (2) einer Bedingung mit visueller und sprachlicher Warnung sowie (3) einem aktuell bereits ähnlich vorhandenem System mit visuellem Hinweis und auditivem Warnton verglichen. Die Wirkung wird im Hinblick auf Kollisionen und die Reaktionszeit auf die Warnung verglichen. Insgesamt zeigen sich deutliche positive Effekte der sprachlichen Warnung. Im Ausblick werden weitere Möglichkeiten von sprachlichen Mensch-Fahrzeug-Interaktionen dargestellt.

### **When objects become part of the body**

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Technological progress provides us with new devices that now mediate what previously has been achieved by direct physical contact. Using explicit (body-ownership questionnaire) and implicit measures (proprioceptive drift rate), together with a synchronous/asynchronous stroking technique, we show that non-corporeal, body-dissimilar objects can be integrated in the body-scheme. We observed stronger body-ownership effects for a functional than for a non-functional object but comparable effects for the functional object and a rubber hand. This supports the assumption that body-ownership emerges from multisensory integration.

### **The Influence of Pitch and Rhythm Processing on Phonological Tests**

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The connection between musical and phonological processing has been addressed in a growing body of research. A particular focus lay on the investigation of individuals with language related learning impairments such as dyslexia or musical processing disorders such as congenital amusia. In the domain of musical processing, some studies concentrated on rhythm and tempo, while others focused on pitch instead. The present study aimed at consolidating these divergent studies and findings by assessing perception and production abilities of both pitch and rhythm to analyze their respective influence on two different measures of phonological processing: a spoonerism task, in which participants were asked to segment and exchange phonemes, and a syllable stress task. Running multiple regression analyses, we found that participants' pitch discrimination abilities predicted accuracy in syllable stress detection. When reducing the sample to monolingual English speaking persons only, results also indicated that reaction time on the spoonerism task was predicted by beat production ability. The results were not influenced by years of musical training, intellectual ability or short-term-memory. Our study shows a connection between pitch perception and phonological processing that has important implications for the investigation of music- and language-related disorders and their interrelations.

## How knowing the rules affects solving the Raven Progressive Matrices test

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It is well established that a narrow set of rules governs the relationship among elements in problems from Raven's APM. Previous experiments indicated that the correlation between Raven's APM and measures of working memory capacity increased, once the rules were known to test-takers. In this study, we used eye-tracking measures to test whether knowledge of the rules might be affecting the strategies that participants deploy while attempting to solve Raven's problems. Half participants ( $n = 24$ ) received an introduction where a set of five rules was taught to them, implying those rules would be sufficient to solve any problem in the upcoming test. The other half ( $n = 23$ ) received common instructions. Eye movements were recorded and analyzed with respect to two areas of interest: the matrix and the response bank. Compared to participants in the control condition, participants in the given-rules condition spent longer on the matrix before gazing at the response bank, and made fewer saccades back and forth between the matrix and the response bank. These eye-tracking data are consistent with the hypothesis that solvers in the given-rules condition are more likely to approach solutions using a constructive-matching strategy.

## Studie in Rot-Grün – Farben aktivieren emotionale Wortbedeutungen

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Farben scheinen unterschiedliche emotionale Konzepte zu aktivieren, die mit der Wortbedeutung interagieren. Meier, Robinson & Clore (2004) fanden einen Zusammenhang von Helligkeit und Valenz: Wörter wurden öfter und schneller als positiv bewertet, wenn sie in Weiß dargeboten wurden. Wörter in Schwarz wurden mit negativen Emotionen verbunden. Die vorliegende Studie sollte untersuchen, ob ein ähnlicher Zusammenhang auch für die Farben Rot und Grün besteht. Rot ist sowohl negativ (Wut) als auch positiv (Liebe) besetzt. Ähnliches gilt für die Farbe Grün: sie symbolisiert einerseits Natürlichkeit, andererseits steht sie für Neid. Probanden sollten in einer Valenzbeurteilungsaufgabe („Ist dieses Wort positiv oder negativ?“) emotionale Wörter charakterisieren, die in Rot oder Grün dargeboten wurden. Da Emotionalität neben Valenz auch durch Arousal definiert wird, wurden beide Faktoren kontrolliert, um Aussagen darüber treffen zu können, welche Eigenschaft den entscheidenden Einfluss ausübt. Die Ergebnisse zeigten kürzere Latenzen und geringere Fehlerquoten für negative Wörter präsentiert in Rot und positive Wörter präsentiert in Grün. Reaktionszeiten und Fehleranzahl stiegen signifikant, wenn negative Wörter in Grün und positive Wörter in Rot gezeigt wurden. Konkrete sinnliche Erfahrungen, wie Farbe, aktivieren demnach emotionale Wortbedeutungen. Dabei wirkt sich Farbe eher auf die Valenz als auf das Arousal aus.

## In touch with WWM: Selective interference between tactile stimulation and visual representations of rotations

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An embodied perspective on working memory suggests that information is maintained in terms of multimodal simulations. Even purely visual material should be maintained – to some degree – in a multimodal fashion. Classic evidence for this notion was reported by Wilson and Emmorey (1998), who showed that verbal working memory is realized in terms of a simulation applying the motor code which is

used for language production: Either sequences of signs, or in terms of spoken syllables. With respect to visual working memory, evidence for multimodal simulations is rather scarce. Therefore, we conducted an experiment combining the change detection paradigm with the dual-task paradigm. Participants had to detect changes between displays consisting of either colored, or rotating triangles. They had either to perform no, or a tactile dual-task. In the tactile task, participants had to detect changes in the direction of a tactile rotation stimulation applied to their left palm. Comparisons of the sensitivity indices obtained in the different conditions, revealed selective interference between the tactile dual-task and change detection performance for rotation velocity. Performance for color change detection remained unaffected. The results imply that working memory for visual rotations is realized in terms of a multimodal stimulation.

### **A comparison of different measurements of pupil size as response to auditory affective stimuli**

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It has been shown in a variety of previous studies that pupil size increases as response to emotionally loaded stimuli (images, words, and sounds). It has been assumed that pupil dilation occurs as a response to highly arousing stimuli, independent of the valence of the stimuli. However, different studies use different measures of pupil size. Moreover, low arousing affective stimuli have rarely been used so far. Hence, the aim of our study was two-fold: first, we are comparing and discussing different measures of pupil size like general pupil size change, change at a certain point of time, maximum, and maximum latency with respect to affective auditory stimuli. Second, we are comparing these different measures for high and low arousing as well as for negative and positive stimuli. Based on our results, we conclude our study by providing a guideline for the use of different pupil measurements.

### **Die Relevanz von Need for Cognition im Kindes- und Jugendalter in Zusammenhang mit der schulischen Leistung**

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Need for Cognition (NFC) ist ein Konzept, welches die intrinsische Motivation beschreibt, sich intensiv mit kognitiv anspruchsvollen Aufgaben auseinanderzusetzen. NFC steht ebenso für die „Freude am Denken“, d.h. Spaß an kognitiven Aufgaben zu haben. NFC korreliert positiv mit tieferer Informationsverarbeitung, besserer kognitiver Leistung und effektiverem kognitiven Problemlösen. Die Korrelation von NFC mit (fluider) Intelligenz fällt dagegen moderat aus. Bei Grundschulern (3. Klasse) ist der NFC-Wert deutlich höher als bei älteren Schülern (6. und 9. Klasse). Der bei Erwachsenen berichtete positive Zusammenhang von NFC zur kognitiven Leistung und Intelligenz zeigt sich jedoch nur bei den älteren Schülern. Die geplante Studie verfolgt das Ziel Erklärungen für den Abfall von NFC von der 3. Klasse an zu finden. Außerdem soll die Entwicklung der Zusammenhänge von NFC mit Intelligenz und Schulleistung ergründet werden. An der Untersuchung sollen Schüler der 3. und 6. Klasse teilnehmen. Neben NFC, sollen Schulleistung, Intelligenz und die Bildungsempfehlung (welche weiterführende Schule dem Schüler vom Lehrer empfohlen wird) erhoben werden. Ebenso relevant sind Persönlichkeitsmerkmale und affektive Komponenten (z.B. der Umgang mit Misserfolg), deren Erhebung noch zu planen ist. Die Datenerhebung soll an Grundschulen und weiterführenden Schulen im Raum Dresden/Chemnitz stattfinden.

## **Neighing, barking, and drumming horses – object related sounds help and hinder picture naming**

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A currently controversially debated question in speech production research is whether lexical selection ought to be viewed as a competitive or a non-competitive process. Previous evidence often cited in support of the competitive view stems from the picture-word interference task. In this task participants name pictures while ignoring distractor words. One major finding is the semantic interference effect: naming latencies are longer with semantically related picture-word pairs (e.g., horse – dog) compared to unrelated picture-word pairs (e.g., horse – drum). However, recently it has been argued that this semantic interference effect might reflect post-lexical processes induced by the use of distractor words and not competitive lexical selection as previously assumed. We addressed this issue by using distractor sounds instead. Participants named pictures (e.g., of a horse) in the presence of different kinds of naturalistic sounds (e.g., neighing, barking, or drumming). We observed facilitation from congruent sounds (e.g., picture: horse, sound: neighing vs. drumming) and interference from semantically related sounds (picture: horse, sound: barking vs. drumming). These results mirror those observed with distractor words in similar conditions and suggest that theories of speech production need to include a competitive selection mechanism at the lexical processing stage, or the pre-lexical processing stage, or both.

## **The influence of a consequence on the readiness potential preceding a self-initiated motor act**

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In 1983 Libet et al. published their finding that the onset time of the movement-related readiness potential (RP) precedes the onset time of the corresponding intention to perform a voluntary motor act by 350 msec. The kind of motor act used by Libet et al. was often criticized for being too artificial. The participants only had to decide when to execute a predefined motor act. Aim of the present study is to compare the RP generated in a Libet task with a RP of a 'real' decision with a consequence. RPs of 24 participants were measured while working on a modified Libet task: Participants watched a rotating clock hand (2,4 sec/revolution) and decided when to press a button (condition A); participants performed the same task and were asked to report the time when they decided to press the button (condition B); participants pressed the button at a predetermined time (condition C). During all conditions participants had the possibility to request a break by pressing a second button. The RP preceding the break request was compared to the RPs generated in the three conditions of Libet task and the differences will be discussed.

## **Novel verbal categories influence the processing of visual object features: Evidence from ERPs**

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Accumulating evidence suggests that linguistic categories can influence visual perception. Whereas theoretical accounts of language-driven categorical perception (CP) mostly focus on verbal labels, the role of the semantic content of categories has been a blind spot in CP research. Therefore, we designed a learning experiment to disentangle CP induced by verbal categories and semantic knowledge. This was achieved by presenting novel objects with counterbalanced assignments of objects to experimental conditions. In two experiments with event-related potentials (ERPs) we studied the time course of CP and explored its interplay with semantic knowledge. Results demonstrate that novel verbal categories influence early stages of visual processing, as reflected in the P1 and N1 components, and that this effect is lateralized to the left hemisphere. This suggests that verbal categories specifically influence the processing of visual object features. Semantic knowledge, in addition to labels, did not further enhance CP (Experiment 1). However, categories formed with semantic knowledge alone also led to CP, albeit in a later visual processing stage (Experiment 2).

## **Source Memory for Unrecognized Items—A Procedural Artifact**

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In a recent empirical study, Starns et al. (2008) observed above-chance source discriminability for old items, which participants had claimed to be new. The finding was interpreted as evidence in favor of the multivariate signal-detection model but against the two-high-threshold model of source memory. According to the latter, “new” responses to old items only follow from the state of old-new uncertainty for which no source discrimination is possible. However, when source judgments are required for old but unrecognized items, participants know that the items have been studied. To test whether this implicit feedback prompts further retrieval attempts, we compared Starns et al.’s task to a task without such implicit feedback. Only when following the original procedure, the finding by Starns et al. was replicated. We thus reject the criticism of the two-high-threshold model and conclude that source memory for unrecognized items is a procedural artifact.

## **Cross-cultural differences in decision making: temperament and character personality profile among different nations in relation to the decision-making process**

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Discounting process is a behavioral measure of decision-making. Brief overview of three types of discounting, including temporal discounting, social discounting and effort discounting, will be presented. Generally speaking, discounting refers to a decrease in the subjective value of a reward (or loss) as its delay increases, size of a group the reward is shared with increases, and an effort required to obtain the reward increases. The aim of the present research was to investigate the relationship between Cloninger's personality dimensions of temperament and character (harm avoidance, novelty seeking, reward dependence, persistence, and cooperativeness) with the rates of discounting among Germans and Poles. In order to evaluate temporal, social and effort discounting rates participants were required to make a series of choices regarding hypothetical amounts of money. Cloninger's personality dimensions were assessed with the Temperament and Character Inventory (Cloninger et al., 1993). The analysis showed differences in effort discounting rate in reference to harm avoidance, reward dependence and persistence dimensions among Germans and Poles. Moreover, quite unexpectedly, the rate at which delayed losses were discounted was related to cooperativeness. The rate of discounting of delayed rewards and social discounting did not differ between individuals with different personality profiles between both nations.

## **Structural and functional neural correlates of risk taking in the balloon analogue risk task (BART)**

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The balloon analogue risk task (BART) is often used to estimate and predict individual differences in risk taking, including real world risky behaviors (Lejuez et al. 2002). But what are the neural underpinnings of individual differences in risk taking in the BART? Previous research into the neural correlates of risk processing has provided consistent support for the involvement of several neural regions. To examine the robustness of these effects and to further current knowledge regarding the neural correlates of risk taking in this task we conducted 1) an Activation Likelihood Estimation (ALE) analysis of neural activation patterns reported for the BART and 2) an fMRI study with 131 participants to identify functional and structural correlates of risk taking in the BART. ALE analyses as well as neural activation patterns of the empirical study confirmed involvement of regions such as the insula, medial prefrontal cortex, and caudate. In turn, voxel-based morphometry analysis of grey matter revealed only weak links between anatomy and risk taking that do not survive control for multiple comparisons. These findings suggest that whilst risk processing in the BART involves activations in a defined set of neural regions, structural markers do not appear to play a major role in determining individual differences in risk taking in this task.

## **Effects of dynamic postural control on mathematical performance and heart rate variability**

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Current research demonstrates close interrelations between the cognitive and postural control system. In the present study, we investigated effects of manipulation of postural control affordances on mathematical performance and heart rate variability (HRV). Subjects performed mathematical tasks (algebra, geometry, numerical calculation) at three complexity levels (low, middle, high) under two postural control conditions (static, dynamic). Electrocardiographic data were recorded continuously at resting baseline, and during each experimental block. Time and frequency domain parameters of HRV were calculated for each test interval. Results show increased mathematical performance over all task domains under dynamic postural control, except of decreased performance in geometry level 2. Results for pNN50 demonstrate a significant main effect for task complexity. Post-hoc tests show increased HRV in low and middle task complexity under dynamic postural control. For the low frequency (LF) domain, a significant main effect was obtained. Post-hoc tests show increased LF at baseline, and for low and middle task complexity. Results show different patterns of cardiac autonomic regulation dependent on postural control affordances. Theoretical frames and practical implications for the design of dynamic work environments will be discussed.

## **Consequences of high cognitive workload on driving behavior**

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Driver Distraction resulting from the usage of in vehicle information or assistance has been an important topic since the last years. Nowadays, the occurring cognitive workload caused by those systems becomes more important since new interaction modalities were developed. A promising method to measure this kind of workload is the detection response task. However, it is also important not only to measure the amount of workload, but to evaluate the consequences of increased workload to the driving behavior. In two driving simulator studies with a total of 60 participants, subjects had to react to critical events in the traffic environment while solving cognitive tasks that differed in complexity. While an increase in cognitive workload induced by the tasks was measured and reported, participants were still able to solve the driving task without a critical decrease in driving performance. Furthermore subjects reported to use strategies solving all tasks simultaneously, leading to the assumption that drivers are able to manage their resources well when they are aware of potential distraction.

**Anger superiority effect in peripheral vision: visual field and target emotion interact  
in determining search efficiency**

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Evolutionary approaches postulate that our perceptual systems are tuned to detect the presence of potential threat in our environment. Research on the visual search for emotional faces has provided inconsistent results. While a lot of empirical evidence confirmed an anger superiority effect, contradictory results show a faster detection of happy faces. Our study aimed to explore the interaction between facially expressed emotions and their location in the visual field. Twenty-eight participants completed a visual search task consisting of displays with six small facial expressions (angry, fearful, happy) located at three different degrees of eccentricity (fovea, parafovea, periphery). Our results showed a strongly significant interaction between facial expression and eccentricity. When the faces were presented on a foveal location angry and happy expressions were more effective at capturing attention than fearful faces, whereas with increasing eccentricity angry faces were detected even faster than happy faces. Overall our findings suggest that location in the visual field and emotional expression interact in determining attentional efficiency in visual search tasks. These results are in line with recent suggestions that neural images of the visual field interact with eye movements to drive active visual processing of biologically relevant stimuli.

**Item Concreteness and List-Method Directed Forgetting**

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Intentionally attempting to partly forget previously encoded information impairs later recall of to-be-forgotten but improves recall of to-be-remembered information. Intentional forgetting can be studied using the list-method directed forgetting (DF) paradigm, in which two groups of participants study two lists of items for a later recall test. One group is instructed to forget the first list after studying it, whereas the other group is asked to remember both lists. Typically, the “forget” group shows costs (poorer recall of List 1) and benefits (enhanced recall of List 2) compared to the “remember” group. Even though the costs and benefits are a very robust finding, there are some boundary conditions of DF (e.g. absence of List 2, mismatch between List 1 and List 2 format). With the present study, we identify a new boundary condition of DF. Based on the assumption that concrete items have an encoding advantage and persist in memory (dual-coding theory; Paivio, 1971), it was hypothesized that the costs of DF would be abolished for concrete but not abstract items. The benefits of DF, however, should remain unaffected by item concreteness. The results of the present study support this hypothesis. Implications for DF theories are discussed.

CANCELED

## Reflections of Human Cognition

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In cognitive psychology, one prominent approach to studying human cognition is the rational analysis. That analysis specifies what information processing demands environments pose to cognitive systems. In so doing, it has provided functional explanations of numerous cognitive phenomena, including the thesis that human memory has evolved to respond to subtle linear and power law relationships in the environment. We extend the rational analysis of human cognition to that of our closest living phylogenetic relatives, chimpanzees. In modeling social contact patterns in wild chimpanzees using 19 years of observational data, we find striking reflections of human cognition in these hominids' environment: Their social contact patterns exhibit the same linear and power law relationships as human environments and human memory functions. Our findings (i) hint at the possibility that human and chimpanzee memory has evolved to solve similar information–processing problems, and (ii) have potentially important implications for theories of cooperation. Overall, the study illustrates how comparative cognitive research can be carried out based on the rational analysis approach.

### How negative arousal affects sequence learning performance in the serial reaction time task

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How affects negative arousal RT and error behaviour in a serial reaction time (SRT) task? This research question was investigated with seventy participants randomly assigned to a neutral/no arousal (n=35) and negative arousal (n=35) condition. Participants performed fourteen blocks of a deterministic SRT task under incidental learning conditions. Highly negative and no arousing pictures, respectively, were presented for several seconds at the beginning of each SRT block. In order to measure sequence learning performance regarding RT and error behaviour change we interspersed a second–order condition (SOC) A with a SOC B sequence in four blocks. Our results indicate that participants in the negative arousal condition showed a higher sequence learning gain and less error rates over time compared to the no arousal condition. These findings, together with further results from a free generation task are discussed in the light of existing investigations focussing on the relation between emotion and cognition.

**Affect binding? The relation between selection processes, distractor evaluations,  
and the subsequent selection of these distractors**

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Responding to a stimulus in the presence of a distractor has negative evaluative consequences for the distractor stimulus (i.e., distractor devaluation; Raymond, Fenske, & Tavassoli, 2003). In the current research, we will first extend previous research by providing evidence that the affective devaluation can happen at the level of specific objects and is larger for interference–creating distractors. Furthermore, we will present data on the relationship between these evaluative changes and response efficiency in subsequent encounters with the prior distractors (either as targets or distractors). Initial evidence suggests that more negative distractor evaluations (i.e., more distractor devaluation) lead to longer response times when responding to previously ignored distractors – but not when responding to (neutral) stimuli in the presence of previously ignored distractors. We will discuss this effect as an affectively mediated process of action control and relate it to the symposium's topic of response binding processes.

**Multisensory top–down sets: Evidence for contingent crossmodal capture**

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Numerous studies investigating the mechanisms of visual selective attention have demonstrated that a salient but task–irrelevant distractor can involuntarily capture a participant's attention. Over the years, there has been a lively debate concerning the impact of contingent top–down control settings on the occurrence of stimulus–driven attentional capture. The aim of the present study was to investigate whether top–down sets would also affect participants' performance in a multisensory task setting. We utilized a non–spatial compatibility task in which the target and the distractor stimuli were always presented sequentially from the same location. Two different target conditions were; i.e. the targets were either unimodal (only visual) or bimodal (visual and tactile). The similarity between the target and the distractor was manipulated by adding tactile stimulation during the presentation of the distractor. In the bimodal target condition, larger compatibility effects were documented following bimodal as compared to unimodal distractors. By contrast, in the unimodal target condition, no differences in the size of the compatibility effects were observed for the unimodal and bimodal distractors. These results indicate that information from different sensory modalities can be incorporated into contingent top–down control settings, but only if these crossmodal information are associated with the target stimulus.

## **Mental Imagery in the Vestibular Domain**

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Vestibular cognition has gained recent attention. A case in point is mental imagery. I will present several studies from our group showing that egocentric spatial transformations and the processing of vestibular information share some common mechanisms. We have measured in different experimental settings including microgravity and we tested healthy participants and participants with vestibular lesions. Despite a wealth of evidence from different paradigms, the mechanisms that underlie vestibular cognition are still scarcely understood. Interestingly, most modeling approaches in vestibular science include a top-down or a priori component. Thus, it is possible that forward models are not only in the service of estimating sensory states but they can also operate in an offline-mode. Conceptual considerations will be discussed in the context of mental imagery, and its relation to vestibular processes.

## **Just noise? – The role of semantics in dynamic event perception**

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Humans perceive dynamic information by segmenting the continuous stream of information into discrete events. The current study examined the role of semantic (e.g., speech) and non-semantic (e.g., ambient noise) information for the perception of audio-dramas. We compared segmentation behavior of participants speaking and understanding German (the language of the audio-drama) with participants who neither speak nor understand German. While German speakers could make use of semantic and non-semantic information during listening non-German speakers could only use non-semantic information. We hypothesized that semantic information is crucial for hierarchical event perception. This means that two coarse event boundaries enclose several fine event boundaries. Thus, we expected the perceived hierarchy to be less pronounced for non-German speakers. In two experiments 64 participants (German and non-German speakers) segmented an audio-drama into coarse and fine events. Consistent with our hypothesis we found that the hierarchical segmentation structure was less pronounced for non-German speakers than for German speakers. However, further analyses showed that non-German speakers could also make use of some semantic cues. These results provide strong support for the importance of hierarchically structured event perception processes (including semantic and non-semantic information) for understanding dynamic events.

## **Effects of walking on uneven grounds on EEG activity**

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Several studies on cortical brain activity substantiate an increase in EEG alpha activity during and after physical exercise. In the present study, we investigated the effects of walking on uneven grounds on EEG activity. Subjects performed a 20-minute walk at defined pace on two different grounds (even and uneven ground). Spontaneous resting EEG was recorded before, during and after walking with eyes open and eyes closed. Results show an increase in temporal theta activity, fronto-parietal alpha activity, and parietal beta activity after walking on uneven ground, with decreased frontal gamma activity after walking on uneven ground compared to walking on even ground in eyes-open conditions. In eyes closed conditions, we found a decrease in temporal and occipital alpha activity, frontal and occipital beta activity, and frontal gamma activity, with a ground by time interaction in theta activity. Our results demonstrate that walking on uneven grounds causes changes in brain activity. We hypothesize that alterations of brain activity result from higher affordances on somatosensory information processing and attentional focusing during walking on uneven grounds.

## **Unethical behavior in economic decision-making paradigms:**

### **What criminals can teach us about fairness norms**

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The Medial Frontal Negativity (MFN) is an event-related potential presumably associated with reinforcement learning and affective evaluation of negative outcomes such as an unfair offer in a gambling situation. In healthy individuals it has been shown that MFN amplitudes are more prominent when outcomes are worse than expected, with recent findings suggesting a relationship between MFN amplitudes and deeply rooted fairness considerations and moral concerns. These fairness norms and their violations are frequently investigated using neuroeconomic games. In order to gain a better understanding of the nature of fairness norms in the context of underlying neuronal correlates, we compared healthy individuals with a group of aggressive offenders regarding elicited MFN amplitudes and gambling behavior in economic bargaining scenarios. There is ample evidence demonstrating that people are willing to accept personal losses for the benefit of social punishment, even when confronted with only moderate norm violations. Individuals scoring high in psychopathic traits, however, lack a sense of moral concerns and exhibit callous and rational behavior, which should be reflected in gambling strategies that are guided by profit-maximizing aspects. Preliminary behavioral and electrophysiological results of this ongoing study will be presented and discussed.

## **Bayesian Reasoning with Verbal Information**

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In sequential diagnostic reasoning, the goal is to infer the probability of a cause event from sequentially observed effects. Typically, studies investigating such tasks provide subjects with precise quantitative information regarding the strength of the relations between causes and effects. By contrast, we examined people's performance when this information is communicated through qualitative, rather vague verbal terms (e.g., "X occasionally causes symptom A"). Using a diagnostic scenario with two cause events and four effect events, we conducted experiments comparing human judgments with a Bayesian model whose predictions were derived using numeric equivalents of various verbal terms from an unrelated study with different subjects. We found a close correspondence between sequential diagnostic judgments based on verbal information and the model's predictions, as well as compared to a matched control condition in which information was presented numerically. This is a promising finding for applying computational models of cognition to verbal reasoning tasks.

## **The perception of relative speed of two bodies as a function of independent observer movement**

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Various studies examined the perception of two moving objects from a static viewpoint or observer movement relative to a reference. However, the influence of observer movement on the perception of relative movement between two other bodies was not thoroughly examined yet. Participants watched two virtual characters running after each other from behind and judged whether the chaser was catching up or falling behind. We adapted the chaser's speed within three staircases to fit a psychometric function targeting at the point of subjective equality of speeds of the characters (PSE) and the just noticeable difference of speeds (JND). This procedure was repeated for an observer who is static or moving with 50%, 100%, or 150% of the speed of the chased person which itself was constant. JNDs were comparable for all observer speeds. However, PSEs increased with the observer's speed showing that observer movement influenced the perception of relative speed of two bodies. The slope of the increase is consistent with a strategy of keeping the partial occlusions of the two characters constant as well as with a strategy of keeping the distance proportion (of the chaser-chased distance on the overall observer-chased distance) constant.

## **Mental mapping impossible environments**

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Two main classes of mental representations describe navigable environments: single coordinate systems and graphs. In coordinate systems each location can be assigned a specific coordinate (maybe on a hierarchical sub-level). Graphs represent local environments as nodes (e.g. a street or room) and the relations between close-by nodes (e.g., two meters straight, one to the left). One difference between graphs and coordinate systems is that coordinate systems have to be consistent; each coordinate refers only to one location and vice versa. This is important, for example, when walking round a block encountering the start location again which was thought to lie further down the street. The start and the current location are identical and represented at the same coordinate. The erroneous estimation of the streets in the loop must be adjusted to fit into the coordinate system. In graphs such consistency is not required; local street length and turns do not have to be consistent in a global metric. To test these predictions participants walked multiple times through a virtual corridor environment roughly 80% round the loop when they visually encountered the start again. Afterwards, they judged the spatial relation between adjacent locations along the loop. The majority of participants adjusted the spatial relations as if they were in a smaller loop than the one walked. However, they adjusted them not far enough to fit into a coordinate system, which would have required an even smaller loop. These results are inconsistent both with classical graph and coordinate representations.

## **Deep Brain Stimulation and Its Effect on Active and Observational Feedback Learning in Parkinson's Disease**

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Parkinson's disease (PD) is typically characterized as a movement disorder. However, motor symptoms are often accompanied by cognitive impairment, including learning deficits. There is evidence that, depending on medication status, PD patients are relatively impaired in feedback learning tasks requiring to link own actions and outcomes, whereas learning by observation seems unaffected. Concerning subthalamic nucleus (STN) deep brain stimulation (DBS) – an established treatment for PD motor symptoms – and its effect on learning, findings are rare and inconsistent. Therefore, the aim of the present study was to examine the effect of STN-DBS on both active and observational feedback learning in PD. Twenty PD patients with STN-DBS and 20 controls completed active and observational feedback learning tasks. PD patients performed both tasks ON- and OFF-stimulation. During the active learning task, subjects responded to abstract visual stimuli by right or left index finger button presses and received feedback after each response. On observational trials, subjects observed the performance of another person. Trials without feedback served to assess learning performance. Preliminary results regarding STN-DBS effects on observational and active feedback learning in PD will be discussed with respect to the necessity to improve understanding of DBS and its impact on cognitive functions.

**Applying Multi-Level Models to Response Time Data:  
A Power Analysis based on Monte Carlo Simulations**

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Experimental psychologists interested in response times typically employ within-subjects designs where each participant is exposed to all levels of the independent variable (treatment conditions). In psychological research, such data are usually analyzed using either Repeated Measures Analysis of Variance (RM-ANOVA), Multivariate Analysis of Variance (MANOVA) or multi-level models (MLMs). The present study used Monte Carlo Simulations to compare random intercept MLMs and MLMs including additional random slopes to RM-ANOVA and MANOVA, with regard to type I error rates and power. Several parameters such as sample size, effect size and sphericity were varied in the simulations. For the MLMs, either likelihood ratio tests or the Kenward-Roger approximation were applied to derive p-values. Results indicate only minor differences in power among the models, whereas type I error rates vary to a great extent. Overall, MANOVA performs well even with small samples ( $N < 30$ ) and MLMs with random slopes and using the Kenward-Roger approximation for obtaining p-values perform well with larger samples. A different approach concerning the violation of sphericity will also be discussed.

**The construction plan for top-down sets: The task environment modulates contingent capture**

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There has been a lively debate concerning the impact of contingent top-down control settings on the occurrence of stimulus-driven attentional capture. To date, however, most studies have focused on the manipulation of just a single feature (e.g. the change of color or shape). In a recent study Mast and Frings (2014) postulated two different feature types: the response feature(s) which are essential for a correct response and the selection feature(s) which could help to differentiate the targets from the distractors. It was found that in a non-spatial compatibility task the size of the compatibility effect was strongly modulated by feature variance in the task environment. A model based on contingent capture was postulated to explain these results due to the feature-overlap between the distractor and the participants' top-down sets. The present study was utilized to test for further predictions of that model by increasing the feature variance. It was found that the size of the compatibility effect was strongly affected by the task environment. These results highlight the importance of context information for creating appropriate top-down control settings with multiple target features.

## **Integrated audio–visual information transfers to long–term memory**

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Human long–term memory for visual objects and scenes is tremendous. However, the question how dynamic audio–visual information is represented in long–term memory has not yet been addressed. Here, we address the question whether auditory and visual information are stored separately or together in an integrated representation by exploring recognition performance for brief audio–visual clips. We are able to show that long–term memory performance for audio–visual scenes is superior to the performance for their unimodal counterparts. Importantly, this audio–visual superiority effect persists when compared to a condition in which participants learn the auditory and visual tracks of the same clip separately. Furthermore, clips with matching audio–visual information elicit higher memory performance than mismatching combinations. Taken together, these findings show that the benefit of audio–visual stimuli in long–term memory emerges from audio–visual integration rather than from a summation of recognition probabilities for unimodal memory traces.

## **Make packages, not scripts! How roxyPackage makes sharing your code a no–brainer**

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The R package `roxyPackage` significantly simplifies the process of packaging your R code. Although it is common practice in the scientific community to share solutions in the form of R scripts, there are several advantages of providing a proper R package instead: It can include unit tests, declare dependencies on other packages, come with standardised documentation, and automatic updates are possible, to name but a few. The drawback of packaging is that it takes more time and effort to manually set up the correct directory structure and write all necessary metadata files. `roxyPackage` automatises this entire workflow; not only does it generate all needed directories and files automatically, it is also capable of maintaining a fully functional, CRAN–like repository for your packages. It uses the `roxygen2` package for generating documentation and supports building source packages as well as binary packages for Windows, Mac OS X and Debian GNU/Linux.

## **Explaining individual differences in use of the recognition heuristic:**

### **The impact of need for cognition and faith in intuition**

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According to the recognition heuristic (RH), when faced with a recognized object and an unrecognized one, people decide based on recognition alone, thus ignoring potential knowledge. While prior work has identified noteworthy individual differences in use of the RH, there is limited research exploring their source. There is, however, a large body of research showing that decision making is affected by personality factors, in particular by need for cognition (i.e. inclination towards effortful cognitive activities) and faith in intuition. Therefore, we investigated whether these personality factors could (in part) explain individual differences in RH-use. In one experiment, participants provided personality measures and worked on two decision tasks with high vs. low recognition validity. In line with our expectations, participants high in need for cognition used the RH less often than participants low in need for cognition, irrespective of its usefulness, when controlling for participants' knowledge. However, there was no significant correlation between faith in intuition and RH-use. Need for cognition and faith in intuition certainly represent just one (partly) successful account to explain individual differences in RH-use and further research is needed.

## **Was, wenn Debriefings wirkungslos wären?**

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Sozialpsychologische Experimente beinhalten häufig Manipulationen, deren Ziel es ist, das Wohlbefinden der Versuchsteilnehmer vorübergehend negativ zu beeinflussen. Ein Debriefing soll diese negativen Effekte aufheben. Allerdings zeigt Forschung im Bereich des Perseveranzeffekts, dass selbst bereits widerrufenen Informationen über Personen oder Ereignisse Auswirkungen auf die Assoziationen und Einschätzungen von Versuchsteilnehmern haben. In zwei Studien testen wir die Möglichkeit, dass auch experimentelle Manipulationen über ein Debriefing hinaus (negative) Auswirkungen auf Versuchsteilnehmer haben können. In Studie 1 erhielten die Versuchsteilnehmer falsche (positive oder negative) Informationen zu ihrer Intelligenz. In Studie 2 erhielten sie falsche (positive oder negative) Rückmeldung darüber, wie andere Personen ihre Attraktivität, Intelligenz und Sympathie einschätzen. Wie erwartet, berichteten die Teilnehmer geringeres Wohlbefinden (z.B. negativeren Affekt, niedrigeren Selbstwert) nach negativer im Vergleich zu positiver Rückmeldung. Diese Effekte blieben selbst dann bestehen, wenn die Teilnehmer vor der Messung des Wohlbefindens über die falsche Rückmeldung debriefed wurden. In Studie 2 gaben die Versuchsteilnehmer, die negative Rückmeldung erhalten hatten, außerdem in einer zweiten Messung (durchschnittlich 78 Stunden später) an, bei der Erinnerung an die (falsche) Rückmeldung noch immer negativen Affekt zu verspüren. Diese Ergebnisse stellen in zentralen Aspekten die Effektivität experimenteller Debriefings in Frage und werfen ethische Fragen hinsichtlich der gängigen Forschungspraxis auf.

## **Decision-making in situations of conscious and unconscious thought: replication experiment**

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In experiments on the theory of unconscious thought (Dijksterhuis, 2004), subjects were given information about several alternatives and ask them to make the best choice. Some participants had to make a decision immediately after being presented with the options. In the conscious thought condition, participants could think about the decision for a few minutes. In the unconscious thought condition, participants were distracted for a few minutes and then indicated their decision. In addition to replicating the effect of unconscious thought we tested the hypothesis that impulsive subjects would be more effective in unconscious thought condition, and reflective subjects in conscious thought condition. Our results shows that the group of unconscious thought revealed stronger differentiation between good and bad estimates of alternatives than in a group of conscious thought at the level of the stat. trends. This leads to the fact that the accuracy of the estimates in group of unconscious thought is higher. Such parameter of cognitive style of subjects as impulsivity (measured using a questionnaire of Azarov) was also associated with polarization estimates. The interaction factor impulsivity/reflectivity and the conditions in which the group operates (conscious/unconscious mind) have not been found.

## **The visual impedance effect depends on the quality and quantity of relations.**

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The visual impedance hypothesis states that visual images are not necessary for reasoning, but that they can even impede reasoning (Knauff, 2013). By varying the quality of the relation in relational reasoning tasks (visual, spatial, visual-spatial and control relations) Knauff and Johnson-Laird (2002) showed that irrelevant visual details slow down reasoning. In this study we wanted to test the boundaries of the visual impedance effect and hypothesized that the visual impedance effect depends not only on the quality of relation, but also on the amount of relations used in reasoning tasks. To test this hypothesis we carried out an experiment with relational reasoning problems and varied the quality of the relation (visual, spatial, visual-spatial and control) and the quantity of relations: while half of the problems had only one relation (e.g., the cat is stronger than the dog), the other half had two relations (e.g., the cat is stronger and older than the dog). We analyzed decision times and show that the quality of the relation as well as the amount of relations influence reasoning performance.

## **The effects of mental fatigue in younger and older adults – an ERP study**

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Mental fatigue leads to deficits in information processing and action monitoring. Due to changes in the frontal dopaminergic system especially older adults may show larger difficulties in sustained performance. The present study therefore tried to investigate the concrete time course of effects of mental fatigue on behaviour and event-related potentials (ERPs) and to what degree those effects differ in younger and older adults. Two groups of healthy participants (14 subjects in the age of 18–30 years and 16 subjects in the age of 55–80 years) had to perform a spatial stimulus–response–compatibility task for more than 3 hours. The experiment was divided in 3 equal blocks by short breaks so that a detailed analysis was possible. Interestingly, the older participants showed an earlier and larger decrease of performance, but seem to benefit more from short breaks than the younger participants. In contrast, the N2 and P3 varied more in younger participants over time than in older. This indicates that the younger adults adjust their resources to the task conditions so that they are able to hold their performance on an appropriate level over a long period of time while the older participants seem to lack these adaptation mechanisms.

## **Distractor–response bindings: Transition from short– to long–term associations?**

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Previous research suggests that bindings between irrelevant stimuli and responses rapidly decay over time, which is a marked difference to bindings between relevant stimuli and responses. While the former bindings decay within two seconds after integration, the latter ones easily survive time periods of several minutes after only one encounter. Yet, assuming that bindings between irrelevant stimuli and responses are just ‘weaker’ as compared to bindings between relevant stimuli and responses, we analyzed bindings between irrelevant stimuli and responses under what we call optimal conditions. Irrelevant stimuli were repeated five times with the same response (albeit always with different targets), they were presented as fixation markers, and they preceded the targets for several milliseconds. Under these conditions, bindings between irrelevant stimuli and responses survived for more than a minute. The fast decay of single encounters between irrelevant stimuli and responses might in fact reflect a protective mechanism that prevents the establishment of incompatible behavioral routines.

## **A Cognitive Explanation for Preference–Consistent Information Sampling in Group Decision–Making**

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While several studies have shown that dogs' performance can be enhanced by the observation of conspecifics (social learning), so far no study has tested whether dogs display conformity, that is, follow an incorrect majority. To fill this void, we adapted the classic Asch paradigm to examine conformity in dogs. In all experimental conditions, dogs could walk past a wall on the left or the right side. In the first phase, each dog (called the observer dog) learned that one direction was associated with a reward. In the three demonstrator condition, the observer dog then watched three other dogs that one after another walked past the wall in the direction contrary to the one the observer dog had learned. In the one demonstrator condition, the observer dog watched one other dog that three times in a row walked past the wall in the direction contrary to the one the observer dog had learned. By contrast, in the control condition, there were no demonstrator dogs. In the test phase, we examined whether the observer dogs stuck to what they had learned. The results revealed that there were no significant differences between the three experimental conditions. Thus, dogs did not show conformity.

## **Does contextual similarity facilitate episodic retrieval processes in the auditory modality?**

### **Evidence from the negative priming paradigm**

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Responding to the identity of a former distractor stimulus is typically impaired as compared with responding to a new stimulus (negative priming [NP] effect). The effect is, in part, caused by an episodic retrieval mechanism: Repeating the prime distractor as the probe target triggers the retrieval of the executed prime response which conflicts with correct probe responding. In two experiments, we investigated whether the auditory NP effect resembles its visual counterpart in being modulated by prime–to–probe contextual similarity. Participants responded to a target sound in the presence of a distractor. A pure tone served as a context and either started abruptly with the sound pair (Experiment 1) or preceded its onset and gradually increased in loudness (Experiment 2). Pitch of the context tone either repeated (same context) or changed (different context) between prime and probe. The NP effect was modulated by contextual similarity, indicated by larger effects in the same context condition. However, this modulation was only found in Experiment 1. This suggests that task–irrelevant events are encoded as part of the processing episode and will act as retrieval cue, but only if they appear simultaneously with the task–relevant events or possess a sudden onset.

## **Is it gone, once it's done? Mechanisms and Modulators of Intention Deactivation.**

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Every day, we form intentions but have to postpone their execution until the proper circumstances are met, an ability referred to as prospective memory. Once completed, intentions should be deactivated as they otherwise might interfere with subsequent tasks. Recent studies, however, show that intention completion entails aftereffects on subsequent performance, suggesting a failure of intention deactivation. Importantly, to date little is known about the mechanisms underlying aftereffects of completed intentions and moderators of intention deactivation. In a series of behavioral experiments we investigated the fate of completed intentions. In contrast to initial studies that suggested a deactivation or even inhibition of completed intentions, studies from our lab and others provide strong evidence for persisting intention-activation fostering automatic intention-retrieval in case of later reactivation. Furthermore, we found aftereffects of completed intentions to decrease with repeated exposure to intention-related stimuli rather than over time, accounting for earlier heterogeneous findings of delay dependent decay of intention-activation. Finally, we found that intention deactivation can in part be modulated by demands of post-completion activities as well as inter-individual differences. Results further our understanding of the mechanisms underlying the deactivation of completed intentions.

## **Verzögerungsverhalten an urbanen Kreuzungen beim Rechtsabbiegen als Indikator für die Zielgerichtetheit der Aufmerksamkeit beim Autofahren**

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Eine kognitive Voraussetzung für sicheres Autofahren ist die räumliche Repräsentation des umgebenden Fremdverkehrs sowie die Erfassung der Komplexität von Verkehrssituationen. Um sowohl den kognitiven Aufbauprozess der räumlich-situativen Repräsentation von Verkehrsinformationen, als auch deren Beeinträchtigung durch kognitive Ablenkung zu untersuchen, wurde eine experimentelle Untersuchung in einem dynamischen Fahrsimulator durchgeführt. Hierfür fuhren 41 Probanden in einem urbanen Verkehrsszenario und näherten sich jeweils 176 Straßenkreuzungen an, an denen sie entweder links (96 Kreuzungen) oder rechts (80 Kreuzungen) abgebogen, während eine auditiv-räumliche Nebenaufgabe (leicht vs. schwer) zum Zeitpunkt des Passierens der Haltelinie dargeboten wurde. In diesem Beitrag werden Ergebnisse von fünf verschiedenen Szenarien beim Rechtsabbiegen mit grünem Lichtsignal vorgestellt. Die Szenarien unterschieden sich hinsichtlich der Anzahl und Bewegungsrichtung von Fußgängern und Radfahrern. Dabei wurden die Daten von insgesamt 1640 Kreuzungen analysiert. Als abhängige Variablen wurden Annäherungsgeschwindigkeit, Bremspedalstellung, Bremsreaktionsstärke, Reaktionszeit in der Nebenaufgabe und die Anzahl der korrekt bearbeiteten Nebenaufgaben erfasst. Die Ergebnisse zeigen, dass sich die Komplexität der Szenarien über das Bremsverhalten ausdrückt. Beim Heranfahen an die Kreuzung mit sichtbaren Fahrradfahrern wird stärker abgebremst als an Kreuzungen ohne Fahrradfahrer. Die Ergebnisse deuten darauf hin, dass Hinweise zur Aufmerksamkeit von Fahrern über Fahrzeugdaten ermittelt werden können, um so intelligente Fahrerassistenzsysteme mit zusätzlichen Informationen anzureichern.

### **Proactive Interference Effects in Olfactory Short Term Memory**

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Modularity of olfactory working memory is supported through cross-modal dual-tasking (Andrade & Donaldson, 2007) and divergent serial position effects (Johnson & Miles, 2009). Another unique characteristic of olfactory memory is susceptibility to proactive interference (PI) (Lawless & Engen, 1977) despite resilience to retroactive interference (RI) (Zucco, 2003). However, these effects are not consistently found, and this unreliability may be due to characteristics such as verbalisability mediating the code with which these odours are represented (Jönsson, Møller, & Olsson, 2011). Additionally, these effects typically concern long-term memory and there is limited investigation of short-term interference effects. A recent-probes task (modelled upon Craig, Berman, Jonides & Lustig, 2013) was used to examine susceptibility of olfactory STM to PI in comparison to verbal stimuli. Multiple trials presented a sequence of 4-odours or words, followed by a yes/no recognition probe. Negative probes could be taken from the immediately preceding or a non-recent trial. It was predicted that odours would demonstrate strong PI effects. However, minimal PI effects for olfactory stimuli regardless of verbal coding were found, compared to strong effects for verbal stimuli. This suggests low sensitivity of STM for odours to PI, and a lack of qualitative differences in olfactory representations when a verbal or perceptual code is used.

### **Modality Effects of the Pupillary Old/New Effect**

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When participants are presented with previously learned words in a recognition task, pupil dilation is increased compared to ‘new’, unlearned words. First, we assessed the generality of this effect by presenting either words or line drawings of similar concepts. Both average based analyses and time-locked permutation tests replicated the lexical old/new effect, and demonstrated a similar graphical old/new effect. Two explanations to this “pupillary old/new effect” have been suggested: (1) Retrieval of old stimuli requires more resources than rejection of new stimuli (“Cognitive Load Hypothesis”), and (2) old stimuli reactivate the previous experience (“Memory Strength Hypothesis”). To assess these hypotheses, we changed modality of half the stimuli between learning and testing. If the Memory Strength Hypothesis is true, stimuli learned as image and tested as semantically matched word should show a larger pupillary effect than the inverse, because learning an image should activate a less specific, hence broader range of concepts, and response times should not be longer for old stimuli if cognitive load is not causal for the effect. Our results confirm these predictions, thereby providing evidence in favor of the Memory strength hypothesis.

## **The Effects of Feedback Valence on Components of Stimulus–Response Associations**

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Stimulus–Response (S–R) learning incorporates at least two component processes: the level of task performance on the stimulus (e.g. to classify a visual object as being large or small; Stimulus–Classification associations) and the action itself performed to indicate the response to the task (e.g. a left key press to indicate that the object is small; Stimulus–Action associations). Interestingly, when stimuli are presented within one task and require one action, later repetition of the stimuli with the same or different task/action shows that these two associations from the stimulus to the two response components are independently retrieved. On the other hand, in recent work we have found that the relationship between S–C and S–A associations (i.e., whether they will be retrieved independently of each other or not) depends on the valence of the outcome of the S–R episode during learning, even if the outcome is not related to performance. This finding shows a qualitative difference in the learning of S–R associations depending on the valence of their outcome. It also raises the question of the processes that underlie S–C and S–A associations and particularly what mediates the connections between these hierarchical components of S–R episodes.

## **Tactile picture recognition and correlations with symmetry, complexity, image agreement and familiarity**

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The study examined the tactile picture recognition and the correlation of symmetry, complexity, image agreement and familiarity with correct responses. Firstly a pilot study has been conducted on a shorter sample size to check the validation of material in Pakistani culture. The participant with age range of 18–25 years, approached from different departments of University of Karachi (except psychology department), through purposive sampling and then randomly assigned either to visual or tactile recognition group. Secondly, 42 sighted participants (23 male and 19 females). For the first stage the visual recognition group was tested on the components of complexity, symmetry, familiarity and image agreement whereas the tactile recognition group were asked to judge in terms of complexity and symmetry. Four hypotheses were formulated. 1– There will be negative correlation between complexity and proportion of correct responses. 2– There will be positive correlation between symmetry and proportion of correct responses. 3– There will be positive correlation between image agreement and proportion of correct responses. 4– There will be positive correlation between familiarity and proportion of correct responses. Whole experiment was done on one to One basis. Finding suggested that the recognition of objects was more correct when there was high familiarity and low complexity, whereas other components have not shown significant differences.

## **Deviating deviants – an ERP study using emotional stimuli in a visual oddball paradigm**

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A controversial debate in neuroscience concerns the question whether affective or cognitive primacy occur in the processing of emotional stimuli. The aim here was to find evidence for either cognitive or affective primacy in the processing of emotional face stimuli in a visual oddball paradigm. Photographs of faces depicting discrete emotions were used as stimuli. In each block frequent stimuli displayed one emotion (e.g. sadness) and faced the participant. The oddballs consisted of three types of deviants: deviants only differing with respect to structure (i.e. faces turned sideways), deviants displaying a different emotion and deviants differing from the frequent stimuli in both, structure and emotion. Results of 17 subjects revealed differences in ERP amplitudes among the deviants. An enhanced P1 amplitude was found in response to oddballs differing in displayed emotion while facing the participant. This ERP modulation happened prior to structural analysis. However, when oddballs additionally to emotion also differed in structure, the processing of the deviating emotional content modulated ERP amplitudes in the time window of the P300, after structural analysis had occurred. In conclusion these results show that depending on stimulus properties evidence for both, affective and cognitive primacy can be found.

## **Measuring approach and avoidance tendencies in romantic relationships**

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In the context of romantic relationships a number of automatic self-regulatory strategies have been identified that fine-tune individuals' perception, evaluation, and behaviour to current situational demands. For instance, individuals' attention to attractive alternative partners is decreased in response to reciprocal romantic interest by a specific partner, thus focusing the individuals attention on the most promising option (Koranyi & Rothermund, 2012). Likewise the assessment of automatic behavioral tendencies both in the phase of initiating as well as maintaining relationships may offer valuable insights. However, existing methods that use response latencies in a joystick task (Neumann, Hülßenbeck & Seibt, 2004; Hofmann, Friese & Gschendner, 2009) have some shortcomings, such as explicitly requiring participants to focus on the stimulus categories of interest, or blockwise manipulation of participants responses. A refined version of these paradigms revealed increased approach tendencies towards attractive (vs. neutral) opposite sex faces in single vs. engaged participants. At the same time our paradigm a) decouples participants required response from stimulus content making it more suitable for the assessment of automatic processes and b) manipulates participants responses on a trial by trial basis, thus eliminating potential order and fatigue effects in a conventional blockwise design.

## **The impact of contingent partner reactions on attentional selection**

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Anticipated action effects support the planning of actions. In some joint action settings, a partner's reactions are predictable consequences of people's actions, enabling anticipation. However, it is not clear under what conditions they influence action selection. In the present study, subjects responded to targets which were either marked by a salient visual onset cue or a subtle endogenous cue, and conflict was created by the currently irrelevant cue. In two halves of the experiment, subjects' actions were followed by compatible versus incompatible reactions of a partner who visually highlighted either the target or distractor. There was no general compatibility benefit but an interaction with attentional cueing: Compatible partner reactions tended to facilitate performance in the exogenous task and produce a cost in the endogenous task. Eyetracking data revealed that with compatible partner reactions, subjects' visual attention was drawn to the visual onset distractor more often before responding, suggesting that "good" partner reactions increased their overall susceptibility to visually salient events. This effect was stronger when subjects recovered from an interruption and thus updated their working memory representation of the current task set. The results indicate that the impact of another person's reactions depends on attentional demands and cognitive control state.

## **Automatic attention to positive and negative stimuli: The role of engagement and disengagement**

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An attentional bias to negative, threat-related stimuli is well documented in the literature. However, also reward-related stimuli can draw visual attention. Wentura, Müller, and Rothermund (2014) imbued colors with valence and, using the additional singleton task, showed that positive and negative colors alike draw visual attention. They suggested that it is not threat or reward per se that draws attention but, more general, relevance. We used a similar valence induction task and replicated the findings of Wentura et al. (2014) with a modified dot-probe task: Both positive and negative colors equally attracted visual attention. We could further show that both the engagement and disengagement component of visual attention contributed to this attentional bias to relevant stimuli. We thus support the idea of a general relevance principle that governs visual attention.

## **Die schwierige Beziehung von Aufmerksamkeit und Bewusstheit**

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Aufmerksamkeit und Bewusstheit sind eng miteinander verknüpfte Konzepte. Die genaue Beziehung der beiden Konzepte zueinander ist Thema intensiver Diskussionen. Koch und Tsuchiya (2007) haben einiges Aufsehen erregt mit dem Standpunkt, dass Aufmerksamkeit und Bewusstheit vollständig dissoziierbare Prozesse sind. Demgegenüber steht das Framework von Dehaene et al. (2006) das annimmt, dass Stimuli je nach Signalstärke und Aufmerksamkeit entweder subliminal, vorbewusst oder bewusst verarbeitet werden. Zur bewussten Wahrnehmung ist demnach Aufmerksamkeit notwendig, aber nicht hinreichend (s.a. Cohen et al., 2012). Die Beziehung zwischen Aufmerksamkeit und Bewusstheit wird dadurch kompliziert, dass beide uneinheitliche Prozesse sind. Block (1995, 2007) unterteilt Bewusstheit beispielsweise in phenomenal consciousness und access consciousness. Koch und Tsuchiya (2007), aber auch Dehaene et al. (2006) beschränken sich in ihren Analysen auf top-down Aufmerksamkeit. Um die Beziehung zwischen Aufmerksamkeit und Beziehung genauer zu untersuchen ist auch die Betrachtung anderer Formen von Aufmerksamkeit notwendig. Chica und Bartolomeo (2012) vertreten beispielsweise den Standpunkt, dass exogene Aufmerksamkeit hinreichend für phenomenal consciousness ist, wohingegen für access consciousness auch endogene Aufmerksamkeit notwendig ist. In meiner eigenen Arbeit möchte ich die Beziehung verschiedener Arten von Bewusstheit und Aufmerksamkeit weiter untersuchen. Mich interessiert dabei vor allem auch, wie der automatische Aufmerksamkeitsbias für emotionale, relevante Stimuli (Brosch et al., 2008) und Bewusstheit interagieren.

## **The role of the fusiform gyrus in face processing: an ALE meta-analysis**

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It has been argued that the fusiform gyrus (FFG) plays a key role in facial processing. However, the exact location of FFG activation differs across studies, possibly due to the use of different stimuli or task instructions. By using quantitative meta-analyses, we here aimed to delineate those regions, that are consistently involved in face processing and to assess the influence of stimuli and task on activation patterns within the FFG. Results revealed significant convergence of face-related activity across all conditions in bilateral amygdala and right inferior occipital gyrus but not FFG. This points to a core occipital-amygdalae system for face processing that is relatively independent from type of facial stimuli as well as top-down attention. Analyses of the individual conditions furthermore showed that convergence in FFG was found for emotion evaluation while for sex evaluation this was not the case. In addition, emotional stimuli activated more posterior parts of the FFG while the analysis of neutral stimuli revealed convergence in more anterior parts. Thus our results indicate that FFG activation is strongly influenced by attention and that there are functionally different parts within the FFG depending on the type of stimuli processed.

### **A memory state analysis of the truth effect**

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Repeatedly seen or heard statements are typically judged to be more valid than statements one has never encountered before. This “truth effect” is also found when assessing validity ratings as a function of perceived repetition instead of factual repetition. More precisely, statements judged to be old typically receive higher validity ratings in comparison to statements judged to be new. However, it is unclear whether this recognition-based truth effect is mediated by the memory states underlying recognition judgments. In order to investigate this question, we applied an extended multinomial two-high threshold model to compare validity judgments for old and new statements in the state of memory certainty (i.e., recognition judgments based on real recognition and distractor detection) and in the state of memory uncertainty (i.e., recognition judgments based on guessing). Although the model-based analyses revealed a truth effect for both memory states, the truth effect turned out to be significantly larger in the state of memory certainty. We discuss this finding in light of the familiarity account of the truth effect.

### **Distractor-based SR binding retrieves decisions as well as motor programs**

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The distractor-response binding (DRB) effect describes (Frings, Rothermund, W& Wentura, 2007) that distractors appearing on the prime display are integrated with the prime response into an event file. The event file is retrieved when the distractor is shown again. Thus, a repeated distractor retrieves a previous response which can be compatible or incompatible to the currently demanded probe response. We analyzed if SR binding influences decision making. We tested this hypothesis with a task in which the participant had to diagnose as fast as possible whether an imagined patient suffered from which of two diseases. This decision was based on two cues; one which did not discriminate between the two diseases and another which was either strong or weakly associated with one of the two diseases. We found a significant influence of repeating the distractor on decision making. However, in previous experiments, the mapping between decision and the key used to indicate the decision was constant. To disentangle if only the decision or the motor program was bound, we conducted an experiment in which the diagnoses was not associated with a key press. The results showed clearly that not only the motor program is bound but also the actual decision.

## **Need frustration decreases well-being—Evidence from a daily-diary experimental study design**

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According to Self-Determination Theory, frustrating the need for competence reduces positive affect and increases negative affect to the same degree for all individuals. The motive-need-matching-hypothesis, however, assumes that inter-individual differences in the implicit achievement motive moderate the link between need frustration and affect: those who want to feel competent should suffer more if their need for competence is frustrated. We tested these predictions by experimentally manipulating the need for competence: in Study 1 we found that competence frustration increased negative affect and decreased positive affect. This effect was not moderated by the strength of the achievement motive. In Study 2, we replicated this effect and showed further that the effect of frustration on affect was moderated by a construct we denote as “need strength”, operationalized as inter-individual differences in the intra-individual coupling of need fulfillment and well-being obtained in a daily-diary study. We conclude that (a) inter-individual differences in implicit motives do not moderate the effect of need frustration on well-being, (b) there are meaningful inter-individual differences in the effect of need fulfillment on well-being which can be found in both daily-diary studies and experimental studies, and (c) combining daily-diary and experimental research can provide fruitful insights into psychological phenomena.

## **Is potency-related information is extracted from shortly presented prime stimuli?**

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According to evolutionary approaches (Sell et al., 2009), it is conceivable that information along the potency dimension is processed automatically. Preliminary support for this assumption comes from a study by Moors and De Houwer (2005) in which pictures of social interactions were presented, with one person being in a dominant position and another person playing a submissive role. Participants were instructed to focus either on person A or on person B across the entire experiment. Their task was to indicate if this person was either on the right side or the left side of the picture by saying the word ‘dominant’ or the word ‘submissive’ (a variant of the Affective Simon Task). Consistent with the assumption that dominance-related information is automatically extracted from the picture, Moors and De Houwer (2005) observed faster responses to dominant persons by using the word dominant and faster responses to submissive persons by using the word submissive. On the basis of these findings one might ask if potency-related information is extracted from shortly presented prime stimuli. In our experiment potency-related words are presented both as primes and targets with a short stimulus onset asynchrony (similar to an affective priming paradigm). As dependent measures the latency of the response to the target stimuli is assessed. Our findings are presented and discussed.

## **The Value of Experimental Psychology in the Development of Teleoperation Systems**

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Teleoperation systems are designed to combine human decision-making abilities with mechanical properties of strength and endurance. By extending a person's sensing and manipulation capabilities to a remote environment, teleoperation systems allow humans to perform tasks in an inaccessible or hazardous environment without putting themselves at risk. Furthermore, coupling humans with robotic systems enables humans to overcome some of their physical limitations as they may enable them to perform tasks at submicroscopic levels or provide them with superhuman strength. As such, teleoperation systems offer numerous benefits for a wide range of applications such as on-orbit servicing of satellites, deep sea mining and telesurgery. However, performance of these human-machine systems is afflicted by various problems, in particular poor movement coordination. Hence, it is of critical importance to investigate the root causes of this movement coordination difficulty during teleoperation and to determine ways in which teleoperation capabilities of humans might be supported. This talk will provide a synopsis of empirical research conducted at the Human Factors Institute at the Universität der Bundeswehr München, which highlights the importance of rigorous experimental research and the value of applying psychology to the development of teleoperation technology.

### **Subliminal priming of the goalkeeper's position in penalty kicking**

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Masters, van der Kamp and Jackson (2006) showed that a goalkeeper's displacement on the line influences penalty taker's decision-making though they are not aware of it, pointing to influences of non-conscious perception on decision-making. It was argued that marginally displacements of the goalkeeper are too small to be consciously perceivable (because they lack the appropriate stimulus strength to allow access to consciousness) but still big enough to allow subliminal perception. That is, stimulus strength was defined as size of displacement so that depending on this size decision-making is influenced either subliminally or consciously. However, the more traditional way to create stimuli that can only be perceived subliminally is presenting stimuli for a very short duration (about 30 ms), thereby manipulating stimulus strength. We tested if subliminal processing of very complex information like the goalkeeper's position relative to the goal's centre is actually possible by presenting information about the goalkeeper's position in a more traditional subliminal priming paradigm. Results showed that complex information like the position of the goalkeeper relative to the goal's centre can indeed be perceived subliminally and subsequently affect decision-making so that we conclude that the off-centre effect can indeed be a case of subliminal perception/priming.

## **The retention of spatial tones in short-term memory**

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Previous studies using electroencephalography (EEG) revealed an event-related potential (ERP) reflecting the retention of pitch and timbre tones in auditory short-term memory, the Sustained Anterior Negativity (SAN). Here, we aimed to observe a similar ERP for the retention of spatial tones. Two, three, or four tones differing in spatial position were presented sequentially. A silent interval of 2000 ms was followed by another sequence of spatial tones. In memory blocks, participants had to retain the tones of the first sequence and to indicate if the tones were the same as those of the second sequence. A central ERP component during retention varied with memory load. This ERP was not observed in control blocks where participants were asked to ignore the first presentation and to indicate if the last tone of the second sequence was presented on the right or on the left. The ERP observed in memory blocks was thus most likely due to active mnemonic retention and not to sensory persistence of the tones of the first sequence. The observed ERP resembles the SAN observed during the retention of pitch and timbre.

## **Understanding intuition from the perspective of fringe consciousness**

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"Fringe consciousness" refers to consciously experienced metacognitive feelings that reflect nonconscious context information (Baars, 1988; James, 1890; Mangan, 1993, 2001; Norman, Price, & Jones, 2011). Common examples include "feelings of rightness/wrongness", "feelings of familiarity" and "feelings of knowing". In this talk I demonstrate how the concept of fringe consciousness can contribute to our understanding of intuition in a broader sense, as well as within specific situations of implicit learning. It has been argued that knowledge acquired in traditional implicit learning experiments cannot always easily be classified as either purely explicit or purely implicit, corresponding to the view of consciousness as a continuum where different degrees of conscious awareness is possible (Cleeremans & Jiménez, 2002). It has also been suggested that implicit learning sometimes involves "intuitive" decisions, with some properties of acquired knowledge being conscious and others unconscious (Dienes & Scott, 2005). Drawing on empirical examples from an ongoing series of implicit learning experiments I show that fringe consciousness represents a useful framework for starting to explore these intermediate states of awareness both theoretically and empirically.

## **Aufmerksamkeitsfokus beim motorischen Lernen: Überlegenheit des internen Fokus bei einer körperorientierten Gleichgewichtsaufgabe**

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Bisherige Forschungsbefunde legen nahe, dass ein auf Bewegungseffekte gerichteter Fokus (= externer Fokus) generell zu besseren Lernerfolgen führt als ein auf Bewegungsabläufe gerichteter Fokus (= interner Fokus; Wulf, 2007). Bisher wurde noch nicht untersucht, ob die Befunde von Wulf und Kollegen auch auf Bewegungsaufgaben übertragbar sind, bei denen die Probanden den Bewegungseffekt nicht in erster Linie visuell, sondern propriozeptiv wahrnehmen können. Die Constrained Action Hypothese (Wulf & Prinz, 2001) und die Funktionalitätshypothese (Künzell, 2007) geben dazu unterschiedliche Vorhersagen und wurden gegeneinander in einem Experiment geprüft: Probanden sollten auf einem Wii Balance Board ihr Gleichgewicht zielgerichtet verlagern. Auf einem Bildschirm wurden ihnen visuelle Informationen und anschließendes Feedback dargeboten. Die Probanden konzentrierten sie sich entweder auf den Druck an der Fußsohle (interner Fokus) oder auf die Verformung der Unterlage (externer Fokus). Entsprechend der Funktionalitätshypothese zeigte die interne Gruppe eine signifikant bessere Leistung als die externe Gruppe. Die externe Instruktion schien zu einer Zusatzbelastung im Sinne einer Doppelaufgabe geführt zu haben. Es wird vermutet, dass gerade diese Zusatzbelastung die Dysfunktionalität des externen Aufmerksamkeitsfokus herbeigeführt hatte. Dies sollte weiter untersucht werden. Aus den Forschungsergebnissen können Implikationen sowohl für die experimentelle Psychologie als auch für die klinische Praxis abgeleitet werden.

### **Modeling working-memory updating**

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Complex working memory tasks such as operation span, n-back, or memory-updating tasks involve retention of relevant material while minimizing interference from irrelevant material (e.g., the arithmetic equations in operation span, outdated memoranda in updating tasks). We present a measurement-modeling framework for identifying parameters of theoretical interest, including the strength of activation of relevant and irrelevant representations, and the strength of binding of (relevant and irrelevant) representations to contexts that could serve as retrieval cues. We illustrate the modeling framework with an application to a working-memory updating experiment. Participants initially encoded four words presented in four different frames. They were then presented with a series of additional words presented one by one, each in one frame. Participants were instructed that each new word replaced the previous word in its frame. After an unpredictable number of updating step, the last word in each frame was tested. People recalled each word by selecting it from a set of candidates, which comprised the last word in each frame, the next-to-last word in each frame, and four words not presented in the entire trial. To separate the contributions of removal of old words and encoding of new words to updating, each new word was preceded by a cue in the same frame. We varied the time between cue and word (available for removing the old word) and the time between word presentation and onset of the cue for the next updating step (available for encoding the word). We comparatively tested two models within the modeling framework, one assuming decay and rehearsal, the other assuming interference and removal of no-longer relevant representations. The interference-removal model proved superior in a Bayesian hierarchical model comparison.

## **Step on it! How Positive Affective States Influence Young Drivers' Driving Behaviors**

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The percentage of young car drivers involved in heavy car accidents is still remaining dramatically high. Traffic psychological research shows that maladjusted driving behavior caused by affective states is a main contributor to traffic accidents. However, while there has been much research on the influence of negative affective states, especially anger, on driving and accident risk, little attention has been paid to positive affective states and their impact on driving behavior and accident occurrence. Therefore, our current experimental study analyzes this influence of different affective states on driving performance with regard to young drivers of different age groups (all < 25 years). In an experimental scenario affective states (positive vs. negative valence) were induced in participants, who were then asked to drive predefined routes in a driving simulator. In order to test a wide range of environmental influences, drivers had to complete different routes in an inner city, a country road and a motorway setting. Results indicated that young drivers drove significantly faster in a positive affective state. This effect was even more pronounced for the youngest drivers on motorways. Implications for further research as well as for applied issues, e.g., in terms of trainings, will be discussed and outlined.

## **Separating influences of sensory stimulation and memory load in a visual short term memory task**

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Studies of short-term memory often confound the number of items to be remembered with the amount of sensory stimulation, possibly biasing estimates of the effect of memory load on performance. Here, we evaluate memory performance by varying the memory set size independently of the number of stimuli present in the display. In our paradigm, the display consisted of eight locations filled with two, four, six, or eight memory items, Gabor patches independently tilted clockwise or counterclockwise from vertical. In one condition, the remaining locations were unfilled. In the other condition, the remaining locations were filled with noise patches, which had similar contrast and spatial frequency content as the Gabors but were un-oriented. Whereas the noise patches evoked similar sensory stimulation as the Gabors they contained no information pertinent to the memory task. 800 ms after the display disappeared, a probe highlighted one placeholder and participants reported the remembered orientation of the Gabor patch presented there. The presence of noise patches reduced memory performance, highlighting the need to control for the amount of sensory stimulation when manipulating memory load. Finally, using linear mixed effect models, we account for interindividual differences and covariates including training and asymmetries across the visual field.

## **Taste quality decoded – dynamic brain response patterns parallel taste sensations**

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In most species, the sense of taste is key in the distinction of potentially nutritious and harmful food constituents and thereby in the acceptance (or rejection) of food. While previous research has focused on how tastants are encoded at the receptor level, it is currently unknown how, when and where taste quality representations are established in the cortex and whether these representations are used for perceptual decisions. To address this question, we used time-resolved multivariate pattern analyses of electrophysiological brain responses evoked while human participants assessed salty, sweet, sour, and bitter tasting solutions. We show that neuronal response patterns allow to decode which of the four tastants participants tasted on a given trial. The onset of this prediction coincided with the earliest taste evoked response (at 175 ms) originating from the insula and opercular cortices indicating that quality is among the first attributes of a taste represented in the central gustatory system. These response patterns correlated with perceptual decisions of taste quality: tastes that participants discriminated less accurately also evoked less discriminated brain response patterns. The results therefore provide the first evidence for a link between taste-related decision-making and the predictive value of these brain response patterns.

## **Do you still know how to get there? Effects of cognitive ageing on route memory**

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Research into the effects of cognitive ageing on route navigation usually focuses on differences in learning performance. In contrast, we investigated age-related differences in route knowledge after successfully learning routes. Young (mean= 21.6 years) and old (mean= 71.9 years) participants were trained on how to correctly recall short routes. We then tested their abilities to recall the sequence in which landmarks were encountered (landmark sequence task), to recall the sequence of turns (verbal directions task), to indicate the direction of turn at each landmark (landmark direction task), and to identify the learned routes among distractor routes from a top-down map perspective (perspective shift task). As well as finding age-related differences for the number of training trials required to learn routes, differences in performance for the perspective shift and verbal directions tasks were found. No differences for the landmark direction or landmark sequence tasks were observed. Interestingly, landmark sequence task performance (compared to the verbal direction task), was not indicative of older adults' abilities to recall the route after the test phase. Given that all older participants were able to successfully recall each route after the training phase, these results suggest differential memory decay for different aspects of route knowledge.

## **Attention and Choice: A Review on Eye Movements in Decision Making**

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This paper reviews studies on eye movements in decision making, and compares their observations to theoretical predictions concerning the role of attention in decision making. Four decision theories are examined: rational models, bounded rationality, evidence accumulation, and parallel constraint satisfaction models. Although most theories were confirmed with regard to certain predictions, none of the theories adequately accounted for the role of attention during decision making. Several observations emerged concerning the drivers and down-stream effects of attention on choice, suggesting that attention processes plays an active role in constructing decisions. So far, decision theories have largely ignored the constructive role of attention by assuming that it is entirely determined by heuristics, or that it consists of stochastic information sampling. The empirical observations reveal that these assumptions are implausible, and that more accurate assumptions could have been made based on prior attention and eye movement research. Future decision making research would benefit from greater integration with attention research.

## **Embodied learning of artificial words referring to novel objects:**

### **Evidence for the experiential trace theory**

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During childhood language is typically learned in a multisensory stimulating environment, and words often co-occur with the objects they refer to. According to the experiential trace theory, words thereby get associated with the multisensory experiences that are made when interacting with the respective objects. In the present study we investigated the role of multisensory experience during word learning in adults. Participants learned artificial words as labels for novel objects in a multisensory stimulating manner. In the learning phase half of the novel objects were located in a spatially high location, the other half in a low location from the participants' point of view. In a second part of the experiment the artificial words were presented on the computer screen in one of four colors. In a Stroop-like task, participants responded to the color of the word with either an upwards or a downwards directed response movement. Responses were faster when the movement direction was compatible with the word's referent location (i.e. the novel object location) in the learning phase compared to when it was incompatible. This finding supports the experiential trace theory and paves the way for future studies with artificial languages in this line of research.

## Variants and invariants in description-based and experience-based decision making under risk

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Several investigations have shown systematic discrepancies between risky decisions based on described versus experienced information, a phenomenon known as the description-experience gap. This gap has often been attributed to an underweighting of small probabilities and overweighting of large probabilities in experience-based choices, a reversal of the pattern typically found in description-based choices. In the present work we conduct a rigorous comparison of the subjective representation of outcomes and probabilities in both types of decision making, in order to understand on which dimensions they diverge and to which extent individual differences in psychological regularities manifest across both experience-based and description-based decisions. This comparison is achieved via the use of a hierarchical-Bayesian implementation of cumulative prospect theory. Results from two studies show a clear and systematic description-experience gap in choice. However, we do not find a qualitative difference in probability weighting. Instead, people showed lower probability insensitivity and increased outcome sensitivity in experience-based choices. Furthermore, individual CPT parameter estimates were found to be correlated across both kinds of choices, suggesting that they are driven by stable individual differences in risky decision making.

## The time course of positive and negative congruency effects in masked priming

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In masked priming, the standard positive congruency effect can reverse into a negative one when the SOA between the masked prime and target exceeds ~100 ms. Although different hypotheses have been offered there is still no consensus in the literature about the origin of this reversal. Here we study the time course of positive and negative congruency effects since stimulus onset using discrete-time competing-risks event history analysis and double arrow primes and targets. In experiment 1 we use constant prime-mask and mask-target SOAs and manipulate mask type (relevant, irrelevant, random lines, no mask) and prime type (congruent, incongruent, and no prime). When no mask was presented a positive congruency effect emerged between 200 and 480 ms after prime onset. When a mask was presented a negative congruency effect emerged between 280 and 440 ms after prime onset, which was largest for the relevant mask and smallest for the random mask. Responses with latencies beyond 320 ms were always correct. In experiment 2 we use a relevant mask and manipulate prime-mask and mask-target SOA, to study whether the negative congruency effect is time-locked to the prime, mask, or target. Our results speak against some of the hypotheses offered in the literature.

**Choosing versus Rejecting revisited: Explanations for a Framing Effect  
that does not hold true for all Countries**

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Shafir (1993) found that some options are judged both better and worse than others. Options with clearly positive and negative features are both chosen and rejected over options with average features. This opposes rational decision making: choosing one option should correspond to rejecting the other. Shafir assumed that positive features count more when choosing, negative features count more when rejecting. In four online–experiments (N=592), we tried to replicate Shafir’s findings and investigated whether his explanations withstand empirical testing. Using one of Shafir’s original tasks and collecting process data, we could replicate Shafir’s findings in the US. In Great Britain and Germany, however, we observed (rational) complementary decision–making. Logistic–regression–analyses confirmed that US decision–patterns differed from those of British and German samples. Process data provides explanations: Choosing/rejecting the enriched alternative was faster than choosing/ rejecting the impoverished alternative in the US, but not in Britain and Germany. Furthermore, more arguments of the enriched alternative were chosen as important in the US than in Britain and Germany. Shafir’s Framing Effect may hence operate only in the US and be rooted in a biased information–processing–style that was observed in the US, but not among Europeans, whether speaking the same language (English) or not (German).

**The validity of Discrete–Option Multiple–Choice tests is not compromised  
by individual differences in answering strategy**

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Discrete–Option Multiple–Choice (DOMC) testing is an alternative to traditional Multiple–Choice (MC) testing. In a DOMC knowledge test, answer options are presented sequentially rather than simultaneously. Therefore, before answering, test–takers can no longer compare all available answer options with regard to their plausibility as in a MC test. Rather, the correctness of each answer option must be assessed separately. A DOMC test therefore allows for a better control of testwiseness. However, the willingness to accept early answer options might differ between test–takers, and might therefore add variance to the total test score that reduces DOMC validity because it is not related to individual differences in knowledge. To obtain a measure of individual differences in the threshold employed to decide whether an answer is acceptable, we used items that did not contain any solution in addition to normal general knowledge items. The number of options that were looked at in items without any solution showed that there were considerable and reliable individual differences in the willingness to accept an early answer. However, the validity of DOMC testing was not affected by these individual differences; both MC and DOMC testing showed comparable and significant convergent validity to external criteria.

## Semantic Relations in Pictures: An Eye-Tracking Study

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When viewing pictures showing an action, observers faster process the agent of the action than the recipient of the action (the patient). This can be shown by faster search times when observers search for the agent of an action than when they search for the patient of an action. We investigated the process underlying this "agent advantage effect" by recording participants gaze while performing agent searches and patient searches. Participants viewed pictures showing two fishes with one fish (agent) biting the other fish (patient). The pictures were randomly presented above or below an initial fixation cross. This allowed us to investigate both early (initial gaze shift on stimulus onset) and late (gaze behavior just before response) processes when viewing pictures depicting semantic relations between an agent and patient of an action. Our results indicate that the agent advantage effect is the result of late rather than early processes of picture perception.

### The cognitive components of risk taking

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Many laboratory risk tasks exist, which capture distinct aspects of risk taking. Mathematical models exist for many of these tasks providing insight in how participants solve a task and due to which cognitive components participants differ in their behavior. For instance, two participants might differ in how often they pump in the BART because they differ in their learning rate to reach the optimal number of pumps or they differ in how many pumps they consider optimal irrespective of learning. Analogous explanations for interindividual differences can be found for virtually all risk tasks. An unresolved question is, whether these cognitive components represent "trait-like" constructs and hence to what degree they are generalizable across tasks and time. In addition, up to date, it has not been examined how different model parameters are interrelated and how they predict risk taking outside the laboratory. To tackle these questions, we elicited risk preferences in 1500 participants in four laboratory tasks that cover critical features of risk tasks used in psychology and economics. For each task we implemented state of the art computational models and estimated for each participant preference parameters, such as the sensitivity to outcomes, loss aversion and probability weighting. Our results suggest that preference parameters nominally differ between tasks, yet a number of parameters correlate across tasks. This suggests that on the one hand, elicited risk preference parameters are highly dependent upon the situation in which decision-making takes place but also reflect trait-like constructs. We will discuss our findings in detail and believe that they help to get a more integrative view of decision making under risk.

## **Triggering insight externally – The role of solution cues**

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While solving a problem, people are not always aware of the processing they employed to reach a solution. Experiencing an insight is equivalent with a sudden proper understanding of the logical relations behind the problem and its answer, whereas intuition does not inform about the underlying logic but is a behavioural outcome of complex processing. The solutions are achieved spontaneously; however, identifying conditions which increase the likelihood of their occurrence is an important step towards understanding the phenomena. In the present study, we tested the effectiveness of different type of solution cues in evoking insightful solutions. 47 participants had to decipher the secret method behind magic tricks, during which online introspective reports were registered. Although possibilities were taken away by showing implausible solutions, subjects could still come up with a solution in 63.7% of the trials and ideated correctly by 42.4% of the trials. Although participants faced the same obstacles, the manipulation of the solution hints resulted in differing solution accuracies. Externally triggered Aha-experiences were operationalized as a steep increase in the feeling of warmth ratings after introducing a solution cue. As we hypothesized, the comparison of the cues revealed a significant benefit for using pictorial cues in contrast to the verbal cues and the baseline condition.

## **Vestibular contributions to spatial aspects of the bodily self**

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The body has a dual character because it is both the seat of our phenomenal self and a physical object. Which pre-reflective and non-conceptual brain mechanisms might bind the self to the body and situate the bodily self within space? I will present evidence from neurological patients with out-of-body experience, as well as neuroimaging and experimental data from healthy individuals during full-body illusions, which collectively show that the spatial unity of body and self can be disrupted. Multisensory conflicts between visual, vestibular and somatosensory signals were used to induce changes of the subjective experience where “I” am located (self-location) and the experience from where “I” experience the world (first-person perspective). These changes in self-location and first-person perspective were distinct from the experience of which body is mine (self-identification) but were associated to individual differences in visual-vestibular integration quantified by subjective visual verticality judgments. Functional magnetic resonance imaging during full-body illusion showed that these changes of spatial aspects of the bodily self were functionally related to neural processing at the temporo-parietal junction—a key region of vestibular cortical processing in humans. In sum, these data suggest that vestibular cortical processing contributes to spatial aspects of the bodily self.

### **Words Suffice - Exploring instructed stimulus–response associations**

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Previous studies on item–specific priming have established the independence of two distinct components of acquired stimulus–response associations: Stimulus–Action (S–A) and Stimulus–Classification (S–C) associations. Here we demonstrate that merely instructing S–A and S–C mappings leads to associative learning and influences later behavior. More specifically, we demonstrate that item–specific switches in S–A and S–C mappings between a prime and a later corresponding probe trial independently affect reaction time and accuracy both when participants act upon prime stimuli as well as when participants are merely instructed about the correct action and classification associated with prime stimuli. The present experiment is the first to show that both S–A and S–C associations can be instantiated by mere instruction, allowing for optimal behavioral flexibility.

### **Thinking with portals: Revisiting kinematic cues to intention**

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What we intend to achieve with our actions affects the way we move our body. This has been repeatedly shown for both, movement–related intentions such as grasping and turning an object, and relatively high–level intentions such as the intention to collaborate or to compete with a social partner. The impact of an intermediate level of intentions – referring to action–contingent changes in the physical environment – is far less clear, however. We present three experiments that aim at scrutinizing this level of analysis by showing how such anticipated consequences affect movement trajectories. Participants steered a virtual avatar toward portals that displaced the avatar to a different but predictable location. Even though this displacement occurred only after the movement was completed, hand movements were clearly torn toward the anticipated final location of the avatar. These results show that properties of anticipated action consequences leave a fingerprint on movement trajectories and provide an opportunity to unite previous accounts on the relation of intentions and movements with general frameworks of action planning.

## **In the beginning was the word: Stimulus–response binding in language switching**

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In language–switching experiments, participants have to name an object in one of two languages. When the language switches from one trial to the next, RT and error rate is higher than when participants can use the same language in two successive trials (i.e., language switch costs). The present study examined the influence of stimulus–response bindings on such language switch costs. Whereas each stimulus is associated with both languages in typical language–switching experiments, we used a constant mapping of stimuli and responses (i.e., vocal response in a specific language). More precisely, stimuli of one semantic category had to be named in one language (e.g., German) whereas stimuli of another semantic category had to be named in the other language (e.g., English) throughout several learning blocks. In a final test block, this stimulus–response mapping was reversed so that each stimulus had to be named in the other language. We observed a substantial DEcrease of switch costs during the learning blocks and an even larger INcrease in the test block. These results demonstrate a remarkable influence of stimulus–response bindings on language switch costs and indicate that stimulus–response bindings can influence between–language interference and control in bilingual language switching.

## **Oculomotor dominance in multitasking – conflict resolution in cross–modal action**

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In daily life, eye movement control usually occurs in the context of concurrent action demands in other effector domains. However, only little research has focused on understanding how such cross–modal action demands are coordinated, especially when conflicting information needs to be processed conjunctly in different action modalities. In two experiments, we address this issue by studying vocal responses in the context of spatially conflicting eye movements (Experiment 1), and in the context of spatially conflicting manual actions (Experiment 2, under controlled eye fixation conditions). Crucially, a comparison across experiments allows assessing resource scheduling priorities among the three effector systems by comparing the same (vocal) response demands in the context of eye movements in contrast to manual responses. The results indicate that in situations involving response conflict, eye movements are prioritized over concurrent action demands in another effector system. This oculomotor dominance effect corroborates previous observations in the context of multiple–action demands without spatial response conflict. Furthermore, and in line with recent theoretical accounts of parallel multiple action control, resource scheduling patterns appear to be flexibly adjustable based on the temporal proximity of the two actions that need to be performed.

### **The impact of disfluency on metacognitive monitoring and control**

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Monitoring and control are two important components of metacognition and affect each other. Judgments are part of monitoring and can be affected by fluency (aka ease of processing). As disfluent texts require more effort, students should judge them as more difficult (ease-of-learning judgment), predict lower performance (judgment of learning) and show lower confidence in retrieved answers (confidence judgment). This should reduce overconfidence and therefore lead to better absolute accuracy. Moreover, better accuracy should foster performance via monitoring-based control. To test these assumptions, students (N = 83) learned either with four disfluent (Mistral) or fluent (Times New Roman) text-passages. After presenting a text-passage, students made ease of learning judgments, and after reading a text-passage, they made judgments of learning. Then a knowledge-test with confidence judgments followed. Afterwards students were allowed to reread the text-passages and finally the knowledge-test was repeated. Results show that disfluency reduces overconfidence. However students did not strongly base control on monitoring, regardless of the fluency-manipulation. Thus higher monitoring accuracy did not lead to better control and to better performance. Further research is required to investigate why students did not base control on monitoring to find ways to implement better monitoring into better control and better performance.

### **The effect of emotional distress on experimentation skills in preschoolers**

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Sodian, Zaitchik and Carey (1991) showed that primary schoolers recognize if experiments lead to conclusive evidence. Further studies (e.g. Croker & Buchanan, 2011) indicated that preschoolers identify conclusive evidence under supportive conditions. In this study, we investigated if emotional distress influences preschoolers' ability to identify conclusive evidence and experiments. We recruited 160 children (75 girls) aged 3-5 years. All children participated in 3 role-plays in which the children had to find out where a type of animal is. The (conclusive and inconclusive) evidence for the animals' whereabouts were the presence/absence of food in traps. The animals varied across the role-plays (mice; mice/bunnies; mice/snakes: fear-inducing condition). Additionally, the children had to choose the trap that conclusively indicates the presence of an animal (identification of the conclusive experiment). The examiners rated children's emotional distress using a 5-point-rating-scale. The results showed no differences between children's performance in the role-plays. However, in all role-plays, children performed better if they showed high levels of emotional distress. Thus, our results suggest that children's emotional engagement has an impact on their experimentation skills. This should be considered in interventions fostering scientific reasoning.

## **Does time seem to drag for the hungry? – Effects of food deprivation and stimulus valence on time perception**

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Prominent models of time perception postulate that arousal speeds up the ticking rate of a hypothetical inner clock, and that attention is responsible for the registration of these emitted pulses (e.g. Zakay & Block, *Curr Dir in Psych Sci*, 1997). Gil, Rousset, and Droit-Volet (Emotion, 2009) found that food pictures are temporally underestimated resulting from attention being distracted from the passage of time. Also, it is known that food deprivation leads to an increase in arousal (e.g. Herbert et al., *Biol Psychol*, 2012). To explore the effects of food deprivation and of the valence of the stimuli on time perception, we manipulated the state of hunger between participants. Food deprived and satiated participants performed a temporal bisection-task and a temporal reproduction-task using food and non-food pictures. Relevant measures regarding temporal biases are presented. The results are discussed regarding the effects of increased arousal of food-deprived participants and the attentional bias of hungry participants regarding food items.

## **Persönlichkeitsaspekte von nachhaltigkeitsorientierten Zielgruppen (LOHAS)**

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Müller-Friemuth et al. (2009) verorten den nachhaltigen Lebensstil der LOHAS (Lifestyles of Health and Sustainability) hinsichtlich Wertorientierungen, Einstellungen und Haltungen in der deutschen Gesellschaft nach dem vom Institut Sinus Sociovision entwickelten Gesellschaftsmodell der Sinus Milieus. Bei einer Reanalyse des Datenpools konnten empirisch fünf Typen rekonstruiert werden. Handelt es sich bei LOHAS somit um keine „kompakte“ Zielgruppe, sondern um eine heterogene Dialoggruppe, wie dies schon im Begriff „Lifestyles“ zum Ausdruck kommt? Um bestimmte Persönlichkeitsaspekte von LOHAS näher zu beleuchten, wurden homogene Konsumentengruppen (N=386) anhand des „Portrait Value Questionnaire“ (PVQ-Kurzversion) von Shalom Schwartz (2007) gebildet. Mittels einer Clusteranalyse wurde eruiert, ob sich die von SINUS in Deutschland identifizierten LOHAS-Gruppen in Bezug auf ihre Wertestruktur auch in Österreich nachweisen lassen. Dies wurde getrennt für Frauen und Männer durchgeführt, um etwaige Unterschiede in den Werten zu analysieren. Um die signifikanten Unterschiede der Gruppen in den Wertetypen zu ermitteln, wurden Varianzanalysen gerechnet. Die von SINUS identifizierte Wertestruktur der LOHAS in Deutschland konnte in ihren Grundzügen auch für Österreich nachgewiesen werden. Die Werte „Universalismus“ und „Benevolenz“ (Selbst-Überwindung) fungieren als Basiswerte für alle untersuchten LOHAS-Gruppen. Weitere Ergebnisse zu Wertedimensionen und zu einer differenzierten Kommunikation der Unternehmensverantwortung werden vorgestellt und kritisch beleuchtet.

**Modeling the sampling and choice behavior during decisions from experience:  
A sequential sampling approach**

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During decisions from experience people choose between two or more lotteries from samples of past experience with them. Work on this topic has primarily focused on the sampling paradigm where participants are presented with unknown lotteries and freely sample as many outcomes as they like from either one. When ready, participants make one final choice between the lotteries for real consequences. We show that sampling and choice behavior during this task is well described as a sequential sampling process where respondents sequentially accumulate outcome information from each sample to form a preference. The best model codes the outcome information such that preference towards one lottery implies a preference away from the other. Some participants use an optional stopping procedure, accumulating preference to a threshold, and then choose the respective alternative. Others use a planned stopping procedure identifying the number of observations to take before sampling. We show how this model can be used to predict sampling and choice distributions at the decision level. It also provides a good account of behavior at the process level revealing how switching between alternatives during sampling impacts choice. Theoretical and methodological implications of this process level view of decisions from experience will be discussed.

**Using the recognition heuristic in highly selected item sets from domains  
with the same or with different recognition validities**

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According to the recognition heuristic, decision makers should infer—whenever they recognize only one object in a pair—that this object has the higher criterion value (e.g., which of two cities is larger). Ecologically rational decision makers should apply this heuristic only in domains in which recognition is a valid cue, thus exploiting regularities of the environment. But (1) do decision makers really adapt their recognition–heuristic use to the recognition validity in the underlying decision domain, irrespective of its validity in the specific set of objects selected for study? Or, (2) do they adjust their use to the specifically selected set, irrespective of the underlying domain? Previous evidence suggests that the answer to Question 1 is yes and to Question 2 no. However, this evidence is partially based on cross–experimental comparisons. Thus, we ran two new experiments. In Experiment 1, we used two selected sets with the same recognition validity, but drawn from domains with different validities. In Experiment 2, we used two selected sets with different recognition validities drawn from the same domain. The results confirm that recognition–heuristic use depends on the domain’s recognition validity, not on the recognition validity in the selected sample of objects.

## How do you remember school sport?

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Could the memories of school sport have an impact on sport biography and its setting? The study is based on Kuhl's personality–systems–interaction theory, 2001. The study took place from 16.12.2008 until 28.02.2010 with 99 volunteers, participating via internet (Quantmeyer de Polack, 2014). Remembering school sport was assessed by, with “good”, “mixed” and “bad” memories. The question was implemented between the outdoor and school sport questions. Sport biography: 1 sport year is defined by, at least one training per week, at least half an hour, at least one year, and its setting by, alone (1), with others (2), institutional group (3). Sport actives with bad memories have less sport years and tend to skip institutional settings. Sport actives with bad memories use more self control (ANOVA for self control,  $F(2, 52) = 5.906$ ,  $p = 0.001$ ,  $R^2 = .185$ ). For the ages 19–59, the influence of remembering of school sport is shown by the MANOVA for activity index in life and setting ( $F(2, 64) = 4.526$ ,  $p = 0.002$ ,  $\eta = .122$ ) and for years keeping the same setting (ANOVA  $F(2, 65) = 9.895$ ,  $p = 0.001$ ,  $\eta = .233$ ).

## Einflussgrößen auf das Fahrerverhalten in zeitkritischen Situationen

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Drei Studien ( $N = 131$ ) wurden im statischen Fahrsimulator durchgeführt, um die Wirkung verschiedener Einflussgrößen auf die Fahrerreaktion in zeitkritischen Situationen im Kontext einer Stadt-, Überland- und Autobahnfahrt zu untersuchen. Es wurde jeweils der Einfluss der unmittelbaren Fahrumgebung sowie die Erwartungshaltung und kognitive Ablenkung des Fahrers untersucht. Betrachtet wurden die Art der Reaktion (Lenken, Bremsen, kombinierte Reaktionen), die Reaktionsgeschwindigkeit und das Blickverhalten. Die Wahl des Fahrmanövers hing maßgeblich vom verfügbaren Bremsweg und Ausweichraum ab. Zudem traten Bremsreaktionen häufiger in niedrigen Geschwindigkeitsbereichen auf, Lenkreaktionen eher in höheren Geschwindigkeitsbereichen. Die Reaktionszeiten auf waren in der Stadt am kürzesten (0.7 – 1.0 Sekunden) und am längsten auf der Autobahn (1.1 Sekunden). Bei der Folgefahrt verlängerten sich die Reaktionszeiten um etwa 0.2 – 0.3 Sekunden. Erwartungseffekte führten zu einer Verkürzung der Reaktionszeiten um 0.2 – 0.4 Sekunden. Ein Einfluss kognitiver Ablenkung war nicht nachzuweisen. Eine Blickabwendung kurz vor dem kritischen Ereignis führte zur Verzögerung der Reaktion um 0.2 – 0.3 Sekunden. Zudem zeigten sich Ausweichreaktionen häufiger, wenn vor dem kritischen Ereignis die Fahrbahnräder fixiert wurden und das Kollisionsobjekt nicht durchgehend angeschaut wurde. Die Ergebnisse liefern Erkenntnisse für die Entwicklung von standardisierten Versuchsbedingungen für Untersuchungen in zeitkritischen Situationen beispielsweise im Kontext der Evaluierung von Fahrerassistenzsystemen.

## **Implementing the Lateralized Readiness Potentials as index of Distractor Inhibition**

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The present study investigated distractor inhibition on the level of stimulus representation. In an experiment (N = 24) participants worked through a sequential distractor-to-distractor priming task. They had to respond to target letters flanked by distractor digits. In addition to reaction time (RT), stimulus-locked lateralized readiness potentials (S-LRPs) of probe responses were measured in order to separate the effect of distractor repetition on sensory processes from those on response activation and peripheral motor processes. The effect distractor repetition compared to distractor change was used as index of distractor inhibition (Frings & Wühr, 2007). Further, distractor-target onset asynchrony was varied. For RTs responses to probe targets were faster in the case of prime-distractor repetition compared to distractor changes indicating distractor inhibition. Benefits in RTs and the latency of S-LRP onsets for distractor repetition were also modulated by distractor-target onset asynchrony. For S-LRPs distractor inhibition was only present with a simultaneous onset of distractors and target. The results confirm the notion of inhibition not being confined to the level of responses (e.g., Neumann & DeSchepper, 1991; Prime & Ward, 2006). Inhibition as a relevant mechanism of object-based selective attention is effective as early as on the level of sensory distractor representation.

## **The effect of emotional information on vestibular perception**

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Recent studies have shown that vestibular stimulation can influence affective processes. In the present study, we examined whether emotional information can also modulate vestibular perception. Participants performed a vestibular discrimination task on a motion platform while viewing emotional pictures. Six different picture categories were taken from the International Affective Picture System: mutilation, threat, snakes, neutral objects, sports and erotic pictures. Using a Bayesian hierarchical approach we were able to show that vestibular discrimination improved when participants viewed emotionally negative pictures (mutilation, threat, snake) when compared to neutral objects. There was no difference in vestibular discrimination while viewing emotionally positive compared to neutral pictures. We conclude that some of the mechanisms involved in the processing of vestibular information are also sensitive to emotional content. Emotional information signals importance and mobilizes the body for action. In case of danger, a successful motor response requires precise vestibular processing. Therefore, negative emotional information improves processing of vestibular information.

**Covert shifts of attention to indexed spatial locations increase  
retrieval performance of verbal materials**

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People look at emptied spatial locations where information was presented during encoding. There is evidence that this so-called „looking at nothing“ behavior plays a functional role in memory retrieval of verbal materials. However, it is unclear whether this effect is caused by the oculomotor movement of the eyes per se or if covertly shifting attention is sufficient to guide the eyes back to associated spatial locations. In an experimental eye tracking study (N = 80), we manipulated whether participants were able to shift either their eyes or their focus of attention to a spatially indexed location while retrieving verbal materials that were associated to a spatial location during a preceding encoding phase. Results indicate that people show a higher response accuracy when they were allowed to shift their attention towards in comparison to shifting their attention away from the relevant location, indicating that covert attention shifts underlie the functional role of the looking at nothing behavior. Keywords: memory retrieval, eye movements, visual attention, memory representation, spatial indexing.

**Stereotypes in face perception – Gender-derived expectations on probable emotional  
expressions influence spatial frequency perception**

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Gender stereotyping is an often discussed process that helps people coping with complex situations on the one hand but frequently covers individual specificities on the other hand. In our study, we explored how emotion-related gender stereotypes affect perceptual processes and thereby maintain or even amplify themselves. We investigated whether stereotypes are translated into perceptual biases by specific gender-dependent tuning-processes of the spatial frequency system. In a dual-task-paradigm participants saw a neutral face of a certain gender that either changed into an emotional face or into a grating stimulus. Emotion-classification and grating-tilt-classification showed the same theory-consistent pattern. Maleness lead to faster classification of angry faces compared to fearful ones and to faster reactions on low spatial frequency gratings compared to high spatial frequency patterns. The opposite was true for femaleness. A context-dependency suggests that this is in fact happening top-down rather than bottom-up.

## **New Look at Intergroup Decisions: Measuring Intergroup Social Value Orientation and Eye-Tracking Information Search**

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To love yourself, to love your team, or to hate the other team – that is the fundamental question in intergroup decision making. Yet, we only know little about systematic distribution preferences in intergroup contexts, and about the underlying cognitive processes of intergroup decisions. The concern we have for other's outcomes is not only determined by our isolated preferences for distribution between "us" and "them" (Social Value Orientation: SVO), but also by "their" group membership. Consequently, we first develop a categorization of decision makers by their preferences for the distribution of resources between themselves, their ingroup and their outgroup: Intergroup Social Value Orientation (ISVO). We present a detailed description of the ISVO measure, and report its predictive validity regarding choices in 2-person intergroup Prisoner's Dilemmas above and beyond conventional, individual-level measures of SVO. Second, we investigate underlying processes of intergroup decision making using eyetracking. We report systematic differences in visual information search of decision makers in 2-person intergroup Prisoner's Dilemmas, depending on information about group membership of the second player and on ISVO. In conclusion, we discuss the applicability of the ISVO measure in intergroup research, and attention-guiding in group-level interventions to promote intergroup cooperation and to overcome ingroup favoritism.

### **Intuition and the Aha-experience**

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Intuitive problem solving is often accompanied by an Aha-experience. Four features define such an experience: (1) the solution comes suddenly and (2) easily to mind; this sudden insight elicits (3) positive affect and (4) confidence that the solution is true. Topolinski and Reber (2010; *Current Directions of Psychological Science*) combined these four attributes into an integrative account of the Aha-experience: Sudden ease of processing elicits positive affect and increases subjective confidence that a solution is true. Such Aha-experiences may be accompanied by experienced lack of control because the solution to a problem is experienced to come from outside. In a questionnaire study (N = 109 totally), we examined seven dimensions of the Aha-experience: suddenness, ease of processing, positive affect, confidence in the truth of the solution, control, motivation, and coping. Each question had to be answered in relation to three stages of an insight: Before the Aha-experience; during the Aha-experience; and after the Aha-experience. The data support the framework by Topolinski and Reber (2010) and suggest that lack of control during the Aha-experience might be another defining feature of an Aha-experience. In addition, such experiences are motivating and contribute to a sense of coping.

## **Primacy Effects in Diagnostic Reasoning across Varying Set Sizes of Candidate Hypotheses**

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Reasoning about sequentially observed symptoms is particularly challenging if the symptoms support multiple candidate hypotheses, one of which has to be selected as a diagnosis. A series of experiments with quasi-medical problems that has already proven participants' bias towards the initially strongly supported hypothesis (primacy order effect) was extended with a new experiment exploring the role of the number of candidate hypotheses. Considering an increasing number of candidate hypotheses was expected to increase cognitive demands during the entire sequence and specifically while ambiguous symptoms had to be integrated. A task with a set of eight hypotheses and with symptom sequences supporting two, four, or eight of them was presented. Cross-experimental and within-subjects comparisons revealed no influence on the primacy effect – neither of the set size of candidate hypotheses nor an influence of the number of current candidates when ambiguous symptoms were processed. We discuss how different explanations of a primacy effect (distorted processing of evidence, competing evidence in working memory) can account for its stability across varying set sizes of hypotheses.

## **The influence of personality traits on information search and coherence shifts in legal decision making**

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In a new paradigm we analyze the influence of personality traits (preference for consistency, cognitive reflection capacity, & HEXACO) on information search and coherence shifts in legal decision making. In three studies we presented three law cases of different severity (ntotal = 260). We find strong coherence shifts as devaluation of the evidence that is in dissent with the current tendency to acquit or to convict the defendant across all studies. In one study enhanced cognitive reflection capacity reduces the extent of coherence shifts. Furthermore, we manipulated the opportunity for a strategic information search. It was either stated beforehand whether the particular pieces of evidence indicate the guilt or innocence of the defendant or not at all. In two studies, there is evidence for a disconfirmatory information search; indicating a search for proof of innocence when having the tendency to convict the defendant and vice versa. Surprisingly, preference for consistency neither influences information search nor coherence shifts in a consistent manner.

## **Priming procedures in online experiments**

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Priming is an established method used in experimental research to temporarily activate specific goals or mental representations, without the participant's awareness. Different priming methods have been developed and applied in laboratory research, but most of them could also be applied in online research to benefit from larger samples and to reach certain target groups. However, since the conditions of online research differ from the conditions in laboratory settings, several criteria are relevant for methodical decisions including the dropout rate, distraction, awareness, and the activation effect. Based on data collected in our own experimental studies and on results of other researchers, we draw conclusions about the application of different priming procedures in online experiments. Our results e.g. suggest that online priming with scrambled sentences increases dropout compared to the priming with questions. Effects were similar for priming with short-stories or picture-sorting. Observational data of online survey programs allow inferences about the distraction or involvement of the participants. Our data suggest that dwell times can be used to identify outliers and that scrambled sentences are generally dwelled longer on than other procedures. Further results about awareness and activation in online priming as well as practical implications for online research will be presented.

## **Evidence for feature binding in guided and non-guided visual attention deployment within the framework of the response selection bottleneck**

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In conjunction search, visual attention binds object features (e.g. color, form) so that the objects are recognized as target or distractors. The resulting serial search process reflects the limited capacity of visual attention. Search times increase with the number of objects. When a portion of distractors share a target feature, visual attention is guided to target feature locations, ignoring other locations. Alternatively, visual attention cannot be preferentially guided if target features are universally shared. We investigated, in two experiments, whether guided and non-guided conjunction searches were subject to the response selection bottleneck. This bottleneck induces sequential performance of the response selection processes of two tasks. In both experiments, participants completed two tasks. We experimentally modulated the temporal interval between tasks (Stimulus Onset Asynchrony). Task 1 was an auditory two-choice discrimination task, which was consistent between experiments. Task 2 was a conjunction search where target features were shared by half of or all distractors in experiments 1 and 2, respectively. We used the locus-of-slack method to analyze reaction times for Task 2, and feature binding in guided and non-guided searches could be performed concurrently to response selection processes. We conclude that visual attention and response selection rely on different capacity limitations.

## The level of expertise shapes the magnitude of adaptation aftereffects in biological representations

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In order to recognize familiar objects, it is commonly assumed that incoming perceptual object information must be matched against representations of these objects stored in memory. While earlier memory theories implicitly claimed that these representations are stable and accurate, recent demonstrations showed that representations are flexible and subject to immediate adaptation following exposure to new information (e.g., Carbon et al., 2007; Strobach & Carbon, 2013). Moreover, learning and expertise reshape the representations and their structure in a way that they show lower changeability in the presence of different individual exemplars (see Gauthier & Tarr, 2002; Daelli, 2011; Tanaka et al., 2012). However, so far, the demonstration of flexible representations is largely limited to representations of faces and investigations on the impact of expertise on the magnitude of adaptation effects are lacking. Therefore, the present study tests adaptation aftereffects in representations of animal categories in persons at different levels of biological expertise. Our data demonstrate the existence of adaptation aftereffects in animal categories which decreases with an increasing level of expertise. Thus, these data illustrate the role of expertise in adaptation of biological object representations, and extend the phenomenon of expertise and flexible memory representations beyond human faces.

## Der Einfluss von Müdigkeit auf das Blickverhalten. Eine Simulatorstudie.

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CANCELED

Müdigkeit ist laut aktueller Unfallstatistik für ca. 1.4% aller tödlichen Verkehrsunfälle verantwortlich. In der Fachliteratur werden hingegen ca. 20% aller tödlichen Unfälle Müdigkeit zugeschrieben. Aus diesem Grund unternehmen sowohl Automobilhersteller als auch Forschungseinrichtungen große Anstrengungen Assistenzsysteme zu entwickeln, die den Fahrer bei Müdigkeit entsprechend warnen. Ein Großteil der am Markt verfügbaren Systeme detektiert Müdigkeit auf Grundlage des Fahrverhaltens. Weitere Möglichkeiten Müdigkeit zu erkennen sind die Analyse des Lidschlag- und Blickverhaltens. Es wird davon ausgegangen, dass diese Parameter verschiedene Müdigkeitsstadien abbilden können. Zur Untersuchung dieser Frage wurde eine Simulatorstudie durchgeführt. Die Aufgabe der Probanden war es, eine simulierte nächtliche Autobahnfahrt mit einer Gesamtlänge von 252 km zu absolvieren. Zur Erfassung der Müdigkeit wurde die "Subjektive und objektive Braunschweiger Müdigkeitsskala", welche alle 10 Minuten in die Simulation eingeblendet wurde, eingesetzt. Das Blickverhalten wurde mit einem Blickerfassungssystem aufgezeichnet. Insgesamt nahmen 32 Probanden (25 Frauen, 7 Männer) mit einem Altersdurchschnitt von 26.2 (SD= 11.6) Jahren an der Untersuchung teil. Ausgewertet wurden das Blickverhalten sowie die Veränderung der Pupillengröße in Abhängigkeit der erhobenen Müdigkeitsstufen. Erste Ergebnisse zeigen, dass sich die Standardabweichung des horizontalen wie vertikalen Blickverhaltens mit zunehmender Müdigkeit verringert. Weitere Ergebnisse werden im Vortrag vorgestellt.

## **An exploration of humans' ability to recognize emotions displayed by robots**

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In modern day life, interacting socially with robots on an emotional basis will become evermore important. However, on the one hand, it is still far from clear which design criteria robots should meet to be capable of adequately expressing affective states and, on the other hand, if humans are capable of interpreting these affective expressions correctly. Our study, unlike others, implements highly complex affective settings in order to stress salient robot design aspects of different types of robots. To fully capture the complexity of human-robot interaction, we used 16 different scenes from robot movies. The scenes showed robots that systematically differed in their anthropomorphic appearances and behaviors. Participants (N=98) rated each robot's appearance and ability to express and convey basic emotions (anger, happiness, sadness, vs. neutral) in affect-provoking situations. Results showed that the selected movie scenes were suitable for the exploration of affective human-robot perception and interaction. Participants were able to classify different robot types portrayed in movies according to their anthropomorphic appearance, behavior, and capability of expressing emotions. Furthermore, the target-emotions were detected with a significantly higher intensity compared to the full range of 20 available emotions. Additionally the influence of participants' emotion recognition ability will be discussed.

## **Goals and habits in addictive disorders – altered mechanisms of decision-making in patients with failure of behavioral control**

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Dual-system theories of decision-making postulate a goal-directed system and a habitual system to compete for behavioral control (Balleine & Dickinson, 1998). Recently, computational modeling accounts of reinforcement learning have amended these theories: goal-directed control is formalized in 'model-based' algorithms, which build a mental model of the environment and enable rapid behavioral adaptation due to computationally complex forward-planning. Habitual control represents retrospective updating as in 'model-free' learning from past rewards by neglecting the environmental structure. This results in slower behavioral adaptation for the advantage of computational efficiency. Human decision-making involves both systems with considerable inter-individual variability (Daw et al., 2011). A breakdown of control over one's actions is a core characteristic of addiction. Computational psychiatry accounts suggest that decision-making might be shifted from the model-based to the model-free control system. To test this in different addiction- and addiction-like samples, we employed a feedback-guided, probabilistic serial reversal task designed to examine behavioral adaptation in a dynamic environment. Combining computational modeling of choice behavior with model-based EEG and fMRI, we show impaired behavioral adaptation in different patient groups and find evidence for less reliance on model-based strategies as well as, on the neural level, reduced representation of model-based signatures in the medial PFC

**Loosing gut feeling: Preliminary results on impaired intuition  
in patients with Major Depressive Disorder**

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Intuitions rely on fast, unconscious and associative processes and help us to manage daily-life. Patients suffering from Major Depressive Disorder (MDD) often complain about difficulties to come to decisions. Thus, possibly their intuitive capacities are impaired. As the experience of negative affect is crucial in MDD, our hypothesis was supported by results from basic research showing that negative affect impairs intuition. Since intuition has not been investigated in the scope of depression research yet, we compared the intuitive performance of patients with MDD ( $n = 29$ ) to a healthy control sample ( $n = 27$ ) using the Judgments of Semantic Coherence Task (JSCT). JSCT is a well-established paradigm to elicit and measure intuitive judgments experimentally. Participants are asked to judge whether presented word triads are semantically related (e.g. CLOUD MILK RABBIT; coherent as all related to WHITE) or not (e.g. DREAM BALL BOOK; incoherent as no common associate). The intuitive performance in this task is reflected by the ability to discriminate between coherent and incoherent triads without being able to explicitly name the common associates. Results revealed that intuition of patients was impaired. The group-difference was not due to a general cognitive deficit in MDD. Furthermore, patients and controls did not differ with respect to explicitly solving coherent triads.

**Learning a spatial search task with uncertain target locations: Insights from eye movement data**

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Interacting with display information of optimization systems frequently requires to cope with uncertain spatial information. To assess learning processes in the context of spatial uncertainty we analyzed choice reactions and eye movements. Participants had to predict at which of three exits distinct target objects will appear. No information was given about the probabilities of the target locations. In order to analyze learning effects, the experiment was divided into four blocks. Our study yielded the following results: the amount of correct responses as well as fixation duration increased significantly over blocks, whereas the amount of fixations, the amount of gaze shifts and response time decreased by and by. These results might suggest that the uncertainty at the beginning of the task caused extensive search behavior, characterized by higher amounts of gaze shifts and shorter fixation durations. Additionally, increasing expertise during the subsequent course of the task leads to more focused visual search which obviously leads to faster responses and lower error rates. Thus, eye movement patterns may be an appropriate measure of task uncertainty and indicates the learning progress of spatial probabilities.

## **Reproducibility Project: Results**

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The Reproducibility Project is a large-scale attempt to examine the rate and predictors of replication in psychological science. It is easy to define “successful replication” as rejecting the null hypothesis ( $p < .05$ ). It is even easier to believe that this definition of replication is valid. In reality, understanding replicability is more nuanced. Null-hypothesis significance testing offers at least two methods for testing replicability, the one just described and another that uses the original effect size as a point-null comparison. Alternatively, aggregating data between the original and replication studies increases the precision of the effect size estimate. In this talk, we: (a) discuss the current evidence for reproducibility based on multiple indicators, and (b) examine which factors predict reproducibility of psychological science.

## **What is reflected in eye-movements to nothing? – Gaze behavior as an indicator of cognitive processes in memory-based decision making**

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The cognitive processes underlying decision making cannot be identified unambiguously based solely on choice patterns. In recent years, eye tracking methodology has been demonstrated to be capable of yielding a wealth of process data that aid in inferring decision strategies. The goal of this talk is to illustrate that eye tracking may even be a promising source of process data in an area in which hardly any process-tracing techniques were available so far: Memory-based decision making. In memory-based decision making the relevant information is not currently present but has to be retrieved from memory. Gaze behavior may still allow to infer underlying cognitive processes as a growing body of evidence suggests that the activation of information in working memory tends to trigger eye movements to the location where the information was originally encoded. This affords a process-tracing method which we refer to as Memory Indexing. A central question for this method is which cognitive processes are reflected in eye movements to “nothing”. I will give an overview of the current evidence suggesting that the search for information in memory, the activation status of hypotheses and the weighting of attributes may be inferred from gaze behavior.

## **Unconscious Conflict Accumulation – A Closer Look at Unconsciously Triggered Sequential Conflict Adaptation**

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With contradicting findings regarding whether a Gratton effect (i.e., an effect of recently experienced conflict) is observable in a masked priming experiment, the verdict on the possibility of unconsciously triggered sequential conflict adaptation is still out. We investigated how the possibility of accumulation of conflict information plays a role in the adaptation to recent unconscious conflict. We used a masked priming paradigm that featured short two-trial and five-trial sequences in which the congruency of the last trial was random, whereas the preceding trials were all-congruent or all-incongruent. After only a single preceding trial, no adaptation was observable: The congruency effect was not modulated by the preceding trial's congruency, which replicates findings of Kunde (2003) and Ansorge and colleagues (2011). However, the congruency effect was reduced when the preceding 4 trials were all-incongruent rather than all-congruent. This result shows that unconscious conflicts do have an effect which is able to accumulate over time and lead to processes of conflict adaptation. The impact of a single instance of unconscious conflict, however, is too weak to be reliably detectable. Inconsistent previous findings regarding unconsciously induced conflict adaptation might be explained by allowing or preventing such an accumulation in the respective experiments.

## **Flanking Stroop – when Flanker interference impacts the Stroop effect**

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Commonly cognitive inhibition is measured by the Flanker task or the color-word Stroop task. In the Flanker task, participants have to identify the central stimulus out of five stimuli. In the Stroop task, they have to indicate the color of a color word. To measure inhibition, incongruent trials (e.g., SSFSS or “red” written in green) are compared to congruent trials (e.g., SSSSS or “red” written in red). In our study, we combined a Flanker task with a color-word Stroop task to investigate the interplay of inhibition underlying the two tasks. We distinguished three conditions. In the pure Flanker condition, participants had to name the color of a central target stimulus. In the pure Stroop condition, participants had to indicate the color of a color word. In a third, combined condition, participants had to name the color of a central letter in a color word (e.g., the color of the letter “o” in the word “brown”). As expected, our results show Flanker and Stroop effects in the pure conditions. More importantly, for the combined condition the Stroop effect was reduced in case of incongruent Flanker trials. Thus, inhibition in Stroop and Flanker tasks cannot be treated as independent.

## Execution Benefits Action Imagery

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Action imagery relies on memories of the imagined action. Imagination should therefore be more similar to execution if an action has just been executed and if actions are familiar. In two experiments participants executed and imagined a familiar and an unfamiliar action (1: walking vs. jumping using one leg; 2: typing as usual vs. using one finger). The same action mode (imagination, execution) was repeated 5 times in alternation for each familiarity condition. Execution and imagination durations became more similar with repeated performance (Experiment 2), and correlations between imagination and execution durations increased with repetitions (Experiment 1 and 2), in particular in unfamiliar actions (Experiment 2). In conclusion, imagination of actions improves based on recent execution experience.

## In a multi-talker scene, neural oscillatory speech-tracking depends on interactions of selective attention and speech acoustics

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Attending to one speaker in multi-speaker situations is challenging. One mechanism proposed to underlie the preferred processing of attended speech is phase-locking of low-frequency activity in auditory cortex to the temporal envelope of speech (“speech-tracking”). However, it is not known whether the attentional enhancement of speech-tracking is driven primarily by the acoustic envelope or additionally utilizes the fine structure of speech. To investigate this question, we compared attentional effects on speech-tracking of natural vs. vocoded speech which preserves the temporal envelope but removes the fine-structure of speech. Participants performed a detection task on an attended stimulus while ignoring another stimulus. We recorded magnetoencephalography (MEG) and compared the attentional effects on the speech-tracking response in auditory cortex. Speech-tracking of natural, but not vocoded, speech was affected by attention, whereas neural tracking of ignored speech was similar for natural and vocoded speech. These findings suggest that information contained in the fine-structure of speech is utilized by the system to enhance speech-tracking in auditory cortex for attended speech, whereas to-be-ignored speech is processed at a more basic acoustic level, relying primarily on the temporal envelope, in a manner similar to the processing of vocoded speech.

## **Cognitive Biases and Skin Conductance Responses**

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Human decision-making is influenced by cognitive biases. These cognitive biases might not only lead to systematic errors in individual decisions, but also influence aggregate market results. So far, research on cognitive biases has been limited to behavioral studies. A psychophysiological perspective is missing. In three experiments, we analyze the psychophysiological mechanisms underlying cognitive biases by means of skin conductance responses (SCRs). Our research question is whether decision biases manifest themselves in changes of the somatic state of an individual. In particular, we study the following cognitive biases: overconfidence (people think that their own judgments are better than objective probabilities), the "gambler's fallacy" effect (people think that events that happen more often than predicted by objective probabilities, will happen less likely in the future) and the framing effect (people react differently depending on whether a situation is presented as a loss or as a gain). We are able to identify body reactions corresponding to the previously mentioned cognitive biases. Further studies, however, are necessary to reveal the causality underlying this finding.

## **Can gender priming eliminate the effects of stereotype threat?**

### **The case of simple dynamical systems**

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Stock Flow problems, a key element of many complex dynamic systems we have to deal with in everyday life, have consistently yielded poor solution rates even among highly educated participants. Previous research also repeatedly reported a significant gender gap: females performed significantly worse than men. The present study is the first to systematically examine a possible cause for this gender gap by manipulating the perceived social gender identity for 264 participants through priming (female, male, neutral) before they were confronted with three different Stock Flow tasks. Female primed women subsequently performed the worst of all six groups and neutral primed men achieved the best results. Men were again shown to perform better than women over all three priming conditions. However, this difference disappeared in the male priming condition as women's performance increased as anticipated. Unexpected was a decline in the male performance in the same condition.

## **How inevitable is distraction by irrelevant speech?**

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In four experiments it was examined to what extent the irrelevant speech effect can be modulated by foreknowledge of the to-be-ignored distractor sequence. Participants remembered visually presented digits while ignoring background speech. In Experiment 1, the upcoming distractor sentence was presented auditorily and visually before the trial. When such specific foreknowledge was given, the disruptive effect was significantly attenuated relative to a condition without foreknowledge. This finding was replicated in Experiment 2, in which the information about the upcoming distractor speech was presented only in the visual modality. Experiment 3 shows that only specific foreknowledge has beneficial effects on the ability to ignore distraction. The mere notification that an unspecified distractor sentence would be presented next had no effect. In Experiment 4, there was only a small and nonsignificant reduction of the disruptive effect when lists of randomly selected words were used as distractor material, suggesting that foreknowledge effects are more pronounced for coherent sentences. We conclude that the disruption of short-term memory by irrelevant speech is not entirely immune to top-down control. A significant proportion of the effect can be modulated by specific knowledge about an imminent distractor sequence.

## **Exploring „listening effort“: A lexical approach to a phenomenon at the boundary of psychological and audiological research**

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Recent research proposes that a reliable measure of listening effort might contribute significantly to the quality of audiological diagnostics. We aspire to create an instrument to capture subjective effort that implements specific properties of speech-in-noise situations as additional subscales, thus remaining as close to the phenomenon as possible. The result is supposed to replace a commonly used single item-scale labeled “effort” which we consider to be too unspecific. We presented various effortful listening situations and asked participants to assign terms to these situations that described their experience of effort adequately. Descriptors were chosen from a lexical pool (30 adjectives/nouns) that has been subsequently broadened by terms the participants themselves created. After their choice, participants were asked to assign priorities to their choices. As a pretest, we presented speech at a comfortable listening level in two conditions of white noise. “Attention” (“Aufmerksamkeit”) outranked “effort” (“Anstrengung”) significantly in subjects’ choices (Wilcoxon signed rank:  $w = 3$ ,  $w_{crit}:n=10, \alpha = .05 = 10$ ;  $w < w_{crit}$ ), showing that “attention” might be the more accessible concept. The poster will show all meaningful descriptors emerging, a first version of an instrument that has been tested with 30 normal-hearing subjects, and its psychometric properties.

## **Masked misattribution from emotional pictures: Which aspects can be differentiated under masked presentation conditions?**

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Many priming studies have shown that emotional stimuli are automatically processed with regard to valence, allowing individuals to differentiate positive from negative emotions, already under masked presentation conditions. Recently, increasing evidence suggests that a more differentiated processing beyond valence can already take place under such presentation conditions. Specifically, employing masked facial expressions as primes, we have found masked priming effects for valence and arousal (Rohr, Degner, & Wentura, 2014; Rohr & Wentura, 2014). So far, these differentiated effects have, however, been limited to facial stimuli. Furthermore, it is unclear whether semantic or emotion-related processes underlie these effects. To approach these open issues, we investigated in three experiments whether specific emotion aspects are misattributed to Chinese Symbols after the masked presentation of pictorial primes (duration: 40 ms, 30 ms). In line with our assumptions, we found emotion-specific priming effects for joy- and sadness-related pictures; fear- and anger-related pictures, however, elicited a mixed pattern of fear and anger responses. We will discuss whether this pattern of effects can be interpreted as evidence for a rudimentary emotional reaction based on valence and arousal, or whether semantic and emotion-related processes underlie the effects, given that these pictures often depict threat, but elicit fear.

## **Ästhetische Stühle bleiben im Gedächtnis**

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Obwohl das ästhetische Erleben sehr subjektiv zu sein scheint, stimmen Personen in ihrer Beurteilung bezüglich des ästhetischen Wertes von Reizen in vieler Hinsicht überein. Wir untersuchten, ob der ästhetische Gehalt von Stühlen eine Auswirkung auf deren kognitive Verarbeitung hat. Die perceptual fluency Hypothese des ästhetischen Erlebens würde annehmen, dass ästhetische Reize einfacher und schneller verarbeitet werden können als weniger ästhetische Reize. Um diese Annahme zu untersuchen, befragten wir zunächst Personen anhand eines Fragebogens bezüglich ihrer ästhetischen Einschätzung von Bildern, auf welchen Stühle abgebildet waren. Die Stühle unterteilten wir daraufhin in drei Kategorien (weniger ästhetische, neutrale, ästhetische). Diese nutzten wir in einem Gedächtnisexperiment. In der Lernphase des Experimentes wurden die Bilder sehr kurz (80 ms) dargeboten und anschließend maskiert. In der darauf folgenden Gedächtnisabrufphase leisteten die Probanden eine Wiedererkennungsaufgabe. Ästhetische Stühle wurden besser wiedererkannt als neutrale und nicht ästhetische Stühle. Zusätzlich waren sich die Probanden bei der Wiedererkennung ästhetischer Stühle sicherer als bei Stühlen der beiden anderen Kategorien. Die Ergebnisse stimmen mit der perceptual fluency Hypothese überein: Ästhetische Bilder scheinen entweder einen erleichterten Zugang zum Gedächtnis zu haben oder leichter abrufbar zu sein.

## **Automatic and controlled processes in prospective memory retrieval, age, and time of day**

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The aim of the study was to investigate automatic and controlled processes in prospective memory retrieval in dependence of time of day and age. From the retrospective memory literature, we expected that controlled processes are predominant at the optimal time of day (i.e., on-peak) and automatic processes are predominant at the non-optimal time of the day (i.e., off-peak) and we hypothesized that the study can contribute to the debate on automatic and controlled processes in prospective memory. We tested young (typically evening-type) and old adults (typically morning-type) at their peak and off-peak times. Besides of age-related differences, the results suggest differential effects of automatic and controlled processes on prospective memory retrieval. However, younger participants outperformed older participants irrespective of testing time (i.e., on-peak vs. off-peak). We discuss the theoretical implications of these findings in terms of a multi-process model of prospective memory retrieval.

## **“Spreading inhibition” in the PRP-paradigm: The relative proportion of NoGo-stimuli in T2 modulates the size of the backward crosstalk effect (BCE)**

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In dual-task performance, the finding of backward compatibility effects has challenged Pashler's (1994) assumption of a response selection bottleneck as they suggest at least some parallel processing of task 1 and 2. This is further supported by Miller (2006) who showed backward crosstalk effects (BCEs) when T2 was a Go/NoGo task. He concluded that NoGo responses lead to an active inhibition process spreading over to R1. We replicated Miller's findings and additionally showed that BCEs depend on the uniqueness of S2. R1-RT was affected in a forced-choice but not in a free choice condition in which S2 only served as a signal to freely decide between a Go or a NoGo response. To investigate whether S2 triggers indeed an inhibitory response, we varied the proportion of Go- vs. NoGo-trials (25%, 50%, 75% NoGo-blocks). Results showed an increased BCE in 25% NoGo-blocks and a reduced BCE in 75% NoGo-blocks. The findings thus support the assumption of “spreading” inhibition as a crucial mechanism which automatically influences R1. Experiment 2 varied the proportion of Go- and NoGo-trials by task context and confirmed this conclusion.

## Ongoing-task Interruption and Prospective Memory

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Event-based prospective memory (PM) is the ability to remember to perform an intention when a critical event occurs in the environment. Recent microstructure models postulate that there are three stages of successful event-based PM fulfillment. First, the event must be noticed and identified as intention-relevant, second the intention must be retrieved from memory, and third the intended action must be coordinated with the demands of the currently ongoing task (cf. Marsh, Hicks, & Watson, 2002). Whereas the cognitive processes at work on Stages 1 and 2 have been extensively studied, little is known about the processes of Stage 3. In the present research we therefore suggest a new paradigm in which the response overlap between the ongoing task and the PM task is experimentally manipulated to isolate stage-3 processes. Results showed that response overlap affected PM performance independent of cue-saliency (Experiment 1) and ongoing-task demands (Experiment 2). We conclude that the processes allowing for an ongoing-task interruption are distinguishable from cue-noticing and intention-retrieval processes and that the necessity to interrupt the ongoing task for successful PM performance puts additional cognitive demands on the individual.

## Vowel frequencies in fictional names are affected by the facial expression of the to-be-named faces

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Two experiments tested the assumption that the vowel /i:/ is included more frequently in fictional names for faces showing a positive than a negative facial expression and the vowel /o:/ is included more frequently in fictional names for faces showing a negative than a positive facial expression. In Experiment 1, participants were presented with positive and negative faces, in Experiment 2, a neutral condition was added. As predicted, both studies showed that more /i:/s were included in the names for positive faces and more /o:/s were included in the names for negative faces. We interpret these findings in terms of a mimicry-based speech motor priming effect: looking at smiling faces provokes smiling as an act of imitation in the participants. This pre-activates the articulatory program used when articulating /i:/ which is therefore more frequently included in the respective fictional names. When looking at negative faces, the production of /i:/ is inhibited.

## How safety gear influences sensory information processing when using a tool

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The impact of wearing safety gear on controlling tools with sensorimotor transformations was surveyed with regard to action control. We set up a motor replication task in which participants performed movements on a covered digitizer tablet while different gains perturbed the relation between hand and cursor movement. Therefore the subjects wore either un-/tinged goggles or thin/thick protective gloves. The task required the (intra- vs. intermodal) replication of an initially performed (seen) hand (cursor) movement in a subsequent motor replication phase without visual feedback. We found that wearing safety gear influenced tactile and visual perception, irrespective of material thickness. Focusing on which information had to be recalled, intra-modal replications while wearing gloves showed fewer aftereffects than intermodal replications while wearing goggles. In intermodal replications translating visual information into a motor action was more susceptible to irrelevant proprioceptive information (in terms of spatial inaccuracy) while in intra-modal replications, proprioceptive information was, despite wearing gloves, immediately available for the replication and irrelevant visual information had nearly no influence. Good news for laparoscopic surgeons: compared to a control group wearing safety gear made sensory information processing more accurate.

## Neuroanatomical changes following working memory training

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In recent years, working memory (WM) training studies have provided insights into the possibilities to improve not only WM functions but also untrained cognitive processes that are related to WM. Imaging studies concerning the functional neural changes following WM training have shown a mixture of decreases and increases in neural functions in brain regions associated with WM processes. However, less is known about the structural alterations that take place in the course of training. The present study set out to investigate this issue to gain more knowledge concerning the neuroanatomical changes that underlie the functional changes, and that may predict training effects in behavior. The study was realized with a training group that trained on a complex, dual-modality WM task (dual n-back) for 16 days. Before and after the training period the participants attended an MRI session in which neurofunctional and neuroanatomical data was collected. The data of this group was compared with the data of an active control group that trained on a single-modality version the n-back task (single n-back) and to the data of a passive control group that did not undergo any training. Neuroanatomical results are reported and discussed in relation to the neurofunctional and behavioral data.

## **The Role of Intentionality and Norm Violation in Children's Causal Attribution**

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When people are presented with a situation in which two agents jointly cause an outcome and one of them thereby violates a prescriptive norm, this agent is often selected as the cause (Hitchcock & Knobe, 2009). The reasons for this influence of norms on causal judgments are controversially discussed in the literature and blame attribution of the norm-violating agent is one possible explanation for it. Interestingly, nothing is known about whether or not children also take norm-violation into account when confronted with causal queries. In a first study we therefore presented 48 five-year-olds with a video where two causal agents contributed to an outcome. The normative status of the behavior of one of the agents was varied across conditions. Children, like adults, tended to select the norm-violating agent over the norm-conforming one. To further investigate the cognitive foundation of the effect, we took a closer look at the role of intentionality for both adults' and children's judgment. We introduced a norm-violating agent who is ignorant of the norm and thus unintentionally violates it. Whereas adults no longer selected the ignorant norm-violator, preliminary data suggest that children still choose this agent as the cause. Data collection for this study is ongoing.

### **(When) Do Prescriptive Norms Influence Causal Inferences?**

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While it is well known that agents are only held accountable for events they have caused, recent findings suggest that the inverse relation between causation and accountability also holds: normative evaluations affect responses to causal test questions. If two agents jointly contributed to an outcome and one of them violated a norm by doing so, this agent is sometimes seen as more causal than the other (Hitchcock & Knobe, 2009). However, this norm-effect is controversially discussed, also because it conflicts with established covariation-based theories of causal judgment which explain causal selection by covariation of cause and effect. We aim at understanding the mechanism of the effect and investigate under which circumstances an influence of norms on causal queries can be found. One interesting question, for instance, regards the purpose of the norm: is the norm-violating agent still selected if the norm he violated is unrelated to the effect? Another important role plays the availability of counterfactual thoughts: they are supposed to determine the norm-effect, but no concrete test of their function exists so far. We will present various experiments in which we manipulate the purpose of the norm and investigate the importance of counterfactual thoughts to better understand the norm-effect.

## Wie reliabel ist die Auswahl von Nachrichtenthemen bei Erstklässlern?

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Mehr als die Hälfte der Tageszeitungen bieten Nachrichten für Kinder an. Den Umgang damit zu lernen, ist in einer mediengeprägten Gesellschaft wichtig. Wie erschließen sich Kinder ein Konzept von Nachrichten und welche Themen wählen sie warum aus? Eine Längsschnittstudie zu diesem Thema liefert Hinweise darauf, dass Grundschüler zunächst eine Nachrichtenauswahl ich-bezogen begründen und erst mit zunehmendem Alter die Perspektive anderer einbeziehen. Von diesen Ergebnissen ausgehend, haben wir in einer Querschnittstudie mit Erstklässlern untersucht, wie reliabel die Wahl und die Begründungen der Themen sind. Die Kinder haben zu zwei Messzeitpunkten, die eine Woche auseinander lagen, je 16 Themen zur Auswahl gehabt. Aus diesen sollten sie jeweils 5 Themen für die Titelseite einer Tageszeitung wählen und ihre Wahl begründen. Variiert wird die Zusammensetzung der beiden Sets. Die Themen-Sets waren laut Expertenranking inhaltlich vergleichbar. Erhoben wird, ob die Mädchen und Jungen in beiden Versionen die jeweils parallelen Themen wählen und ob sich die Begründungen in ihrer Ich-Bezogenheit unterscheiden. Die Ergebnisse zeigen, dass die Reliabilität für einige Themen hoch ist, für andere nur im mittleren Bereich liegt. Diskutiert werden Gründe für die unterschiedliche Reliabilität.

## Sex hormones, not sex matter: Postnatal sex hormone concentration in infants has an impact on sentence comprehension abilities at age 4 years

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Gender differences in cognitive behavior have been of great research interest in the past years. Especially during language development, differences between boys and girls were reported. Recently, researchers have started to investigate the relationship between language function, brain differences, and diverse sex hormones, such as testosterone and estradiol. However, little is known about the association between early postnatal sex hormone concentration, language-related brain activity, and later language development. In order to investigate this research question, we analyzed the impact of testosterone and estradiol in girls and boys on sentence comprehension at age 4 years. Further, we considered the event-related potential component Mismatch Negativity in response to phonemes as an indicator for their language related brain activity at age 5 months. We found a strong positive impact of estradiol and a strong negative impact of testosterone on later sentence comprehension for both, boys and girls. Additional variance in sentence comprehension abilities at age 4 years can be explained by the MMN and the interaction between the MMN and sex hormones at age 5 months. These results demonstrate that the development of sentence comprehension abilities is influenced by postnatal sex hormone surge, probably mediated by language related brain areas and brain activity.

**I am bad and she is lovely – Electrophysiological correlates of processing  
emotional adjectives in self-referential contexts**

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The present study investigated whether different reference contexts impact the processing of emotional adjectives. Event-related potentials (ERPs) were recorded while participants silently read a series of emotional and neutral adjectives that were preceded by short sentences, providing varying degrees of self-reference. Reference context and emotional meaning modulated various ERP components after adjectives' onsets. Initial effects of the reference context occurred already at a very early processing stage, reflected in modulated amplitudes of the P1 component. The early posterior negativity (EPN), an ERP component supposed to reflect rapid attention capture by emotional stimuli, was elicited by both emotionally positive and negative compared to neutral adjectives, independent of the context variation. At later processing stages, positive adjectives elicited enhanced amplitudes of the late positive complex (LPC), which is supposed to reflect sustained elaborate processing. This effect was followed by an LPC-like component for both emotional and neutral adjectives embedded in strongly self-referential contexts. For negative adjectives, an N400-like effect was observed, presumably reflecting a reduced reference-independent predictability of negative adjectives. Together, our findings demonstrate that the degree of self-reference and emotional meaning allocate sensory resources at early stages of visual word processing and influence higher-order appraisal of stimulus relevance.

**Is there a bimodal advantage in language switching?**

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Studies on language switching have shown that switching from one language to another leads to switch costs (i.e., higher reaction times and increased error rates in switch trials compared to repetition trials). Whereas the output modality was constant (e.g., always vocal responses) in previous studies, the present study used both vocal responses (i.e., speaking the word) and manual responses (i.e., typing the word) in a picture-naming task, in which participants had to switch between English and German in unimodal and bimodal blocks. In unimodal blocks, participants were instructed to answer constantly in the same output modality (e.g., only vocal responses for English and German). In bimodal blocks, every language was clearly assigned to one output modality (e.g., English: vocal responses; German: manual responses). Thus, in bimodal blocks, participants had to switch additionally between output modalities whenever they switched the language. Switch costs were not significantly influenced by the kind of block (unimodal versus bimodal). However, the results demonstrated shorter overall reaction times and lower error rates in bimodal blocks compared to unimodal blocks. Thus, using different output modalities for every language lead to a bimodal advantage in language switching which we attribute to reduced between-language interference.

### **Conceptual and Specific Self-prioritization**

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After a short learning phase in which formerly neutral geometric shapes were associated either to the self, to a familiar person, or to a neutral instance a prioritization of self-associated shapes over the other shapes has been shown (Sui et al., 2012). In order to figure out the underlying processes of the self-prioritization effect we associated single features (e.g. shape) or feature-combinations to the self (e.g. shape and color). Intriguingly, when participants were instructed with a feature-combination single features of a particular combination were not prioritized; instead only the conjunction of both features profited from self-prioritization. The data suggests that self-prioritization is based on concrete feature-combinations albeit the representations of these features can be perceptual as well as conceptual.

### **The sounds of safety: How music creates the illusion of a safe environment**

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As with any sensory input, music listening might be expected to incorporate the processing of information about the safety of the environment. If so, (1) there should be an optimal, subjectively preferred music tempo depending on its information density; slower and faster tempi should elicit experiences of higher stress and danger and (2) in general, sonic scenarios with music should reduce experiences of stress and danger more than other scenarios. In Experiment 1, the tempo of short music-like rhythmic stimuli was manipulated. In an initial session, listeners adjusted the tempo of the stimuli to what they deemed an appropriate tempo. In an ensuing session, the same listeners judged their experienced stress and danger in response to the same stimuli, as well as stimuli exhibiting tempo variants. Results are consistent with the existence of an optimum information density for a given rhythm; that the preferred tempo decreases for increasingly complex rhythms; and that optimum tempos are associated with lower stress and danger. In Experiment 2, listeners should indicate their experience of stress and danger in response to different sonic scenarios: music, natural sounds, and silence. As expected, the music scenarios were associated with lowest stress and danger whereas both natural sounds and silence resulted in higher stress and danger. Overall, the results largely fit the hypothesis that music seemingly carries safety-related information about the environment. This can be one important aspect in understanding the evolutionary origin of music.

## **The effects of divided attention on commission errors in the delay execute paradigm**

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Prospective memory (PM) refers to our memory for future tasks. In many instances a PM task may be remembered but the execution of the task needs to be delayed (delayed execute PM). Forgetting of tasks (omission errors) can have consequences, but repeated execution of a task (commission errors) may also be problematic. We investigated the effect of PM task status on commission errors in delayed execute PM tasks. The PM task status was either finished (PM task was executed and declared finished before the final part of the experiment) or cancelled (PM task was declared cancelled after instruction and was never executed before the final part of the experiment) and we manipulated cognitive load (divided attention vs. no divided attention) in the final part of the experiment. Replicating previous studies, we observed more commission errors in the canceled condition compared to the finished condition. With divided attention, we observed no commission errors in both conditions. The present results indicate that inhibiting/deactivation of a PM task is easier after PM task execution and that this effect also extends to delayed execute PM tasks. Theoretical implications of the results with divided attention are discussed.

## **Oscillatory dynamics of lexical predictions in the perception of speech sounds**

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Anticipating the featural content and the time point of a particular sensory event ('what happens when?') is beneficial for processing. Current frameworks of brain functions espouse the notion of prediction and prediction error and suggest minimally redundant representations. Linguistic theory has also stressed the advantage of abstract sound representations, but hitherto, the two concepts exist relatively independent from each other. In this talk, I try to link these two views, by focusing on predictive neural processing of speech vowel sounds, as occurring in and differentiating between the words 'pin', 'pen', and 'pan'. In a Magnetoencephalography study, examining the Mismatch Negativity (MMN) component of the event-related fields, MMN amplitudes were found to pattern in line with the assumed lexical vowel representations. In particular, less specific deviants in a more specific standard context elicited higher MMN amplitudes than more specific deviants in a less specific standard context. Importantly, less specific standards additionally differed from more specific standards in pre-stimulus beta-frequency (15–30 Hz). This is strong evidence for a dynamic generation of lexical predictions that differ according to the specificity of the speech sound, with more specific sounds resulting in stronger predictions than less specific sounds.

**Saliency and the Speed of Visual Processing:  
A Novel Method Based on Temporal Order Judgments**

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The Theory of Visual Attention (Bundesen, 1998) has been extensively employed to model and measure selective attention in visual processing. The data that is assessed is typically obtained from post-masked letter recognition tasks. Mostly, this is not because letters are of any special interest. They are rather practically required, representing well overlearned stimuli which can be properly masked after a certain presentation duration. The restriction to the use of letters, and the necessity to mask them, severely limits the applicability of traditional TVA-based methods. Here, we demonstrate a novel TVA-based approach that is not subject to these limitations and apply it in the domain of visual saliency. Participants perform temporal order judgments of two stimuli of varying saliency. Saliency is varied by adjusting the local contrast in orientation of target line segments in a pattern of background line segments. A Bayesian model comparison is performed for psychometric models of temporal order judgments, which are derived from TVA. These allow the estimation of parameters, such as the visual processing speed and others that describe the process, and which may be influenced by the saliency of the targets. The investigation of processing parameters of such simple pop-out targets becomes possible because the TOJ-based task neither requires letter targets, nor does it rely on post-masking the targets. To our knowledge, assessments of the processing speed and mechanisms of pop-out targets have before been possibly only employing electrophysiological or reaction time paradigms, both of which may be complemented with results obtained with our method.

**Measuring workload during steering: A novelty-P3 study.**

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The workload of a given task, such as steering, can be defined as the demand that it places on the limited attentional and cognitive resources of a driver. Given this, an increase in workload should reduce the amount of resources that are available for other tasks. For example, increasing workload in a primary steering task can decrease attention to oddball targets in a secondary auditory detection task. This can diminish the amplitude of its event-related potential (i.e., P3; Wickens et al., 1984). Here, we present a novel approach that does not require the participant to perform a secondary task. During steering, participants experienced a three-stimuli oddball paradigm, where pure tones were intermixed with infrequently presented, unexpected environmental sounds (e.g., cat meowing). Such sounds are known to elicit a sub-component of the P3, namely novelty-P3. Novelty-P3 reflects a passive shift of attention, which also applies to task-irrelevant events, thus removing the need for a secondary task (Ullsperger et al., 2001). We found that performing a manual steering task attenuated the amplitude of the novelty-P3, elicited by task-irrelevant novel sounds. The presented paradigm could be a viable approach to estimate workload in real-world scenarios.

## **Effects of reducing the number of candidate tasks in voluntary task switching**

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Recently, Demanet and Liefoghe (2014) reported an experiment on voluntary task switching (VTS) in which the number of candidate tasks was reduced from four to two before participants indicated their task choice to prevent them from choosing a task in advance. This procedure is highly similar to a procedure employed by Kleinsorge and Scheil (in press) using cued task switching, which yielded evidence for a selective facilitation of task switches by a reduction of the number of tasks. To examine whether a similar effect would also be observed with VTS, we conceptually replicated the experiment of Demanet and Liefoghe with an additional control condition in which the number of tasks was not reduced. In this experiment, no evidence for a facilitation of task switching could be observed, pointing to a functional divergence between explicit task cues and internally generated cues involved in VTS. Additionally, we observed evidence for a selective advantage of forced switches over repetition-possible trials that was largely independent of preparation time. This effect was accompanied by an increase of task indication times in conditions with a reduced number of tasks, suggesting that this manipulation resulted in a pronounced change in the way participants performed voluntary task switches.

### **Affective priming meets working memory:**

#### **Using a change detection task to measure priming effects**

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Recent research suggests that in priming paradigms prime and target are activated in parallel with mutual facilitation in case of congruent stimuli (Schmitz & Wentura, 2012; Schmitz, Wentura & Brinkmann, 2014). Interestingly, parallel activation of several items is the core topic of working memory research; however, it is rather unexplored what happens when stimuli in working memory are evaluatively related to each other. Thus, it seems worthwhile to link priming and working memory research. The present study used a change detection task with happy and angry faces to investigate whether evaluative congruency improves working memory performance. We used a whole-display recognition task. Accordingly, participants have been required to indicate whether or not a face was replaced by another one in trials containing two successive displays with emotional faces. We presented participants with evaluatively congruent displays (all faces expressed the same emotion) and incongruent displays (the display contained happy and angry faces). The results indicate a better performance for evaluatively congruent trials compared to incongruent ones. This effect observed by a standard working memory task is essentially an evaluative priming effect.

### **Language cues in the formation of hierarchical representation of space**

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The formation of a hierarchical representation of space can be induced by the spatial adjacency of landmark objects belonging to the same semantic category, as was demonstrated in a route planning experiment in a hexagonal, iterated y-maze in a virtual environment. (Wiener & Mallot, 2003). The regional subdivision can influence navigation and memory processes. Using the same paradigm, we tested the efficiency of linguistic cues with various hierarchical categorization principles in regional structuring. In different conditions, the experimental environment was parceled (i) with landmarks of different semantic categories, (ii) with superordinate fictive proper names, (iii) with superordinate prototypical names, (iv) with words from different semantic categories and (v) with whole-parts relations. Results: The results of the landmark-condition confirmed the findings by Wiener & Mallot (2003). For the linguistic conditions, higher error rates as well as strong differences in the prevalence of region-consistent route choices were found. A significant preference was found only for the whole-part condition. We therefore suggest that language-based induction of hierarchies must be in itself of spatial nature to induce a hierarchy in the representation of space.

### **Testing colorimetric measures of saturation**

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For most color spaces, there is at least one measure for determining the saturation of a color. Although these measures are not ordinally equivalent it is unclear how well they correspond to human perception. In an attempt to fill this gap we conducted a psychophysical experiment. We chose three color directions and three standard colors from CIE 1931 space. In each trial, one of the three standard colors was shown along with a color that was sampled from one of the three color directions on color calibrated monitor. Participants were asked to decide which of the two colors was more saturated by pressing one of two buttons. The resulting data allowed us to compute the point of subjective equality (PSE) for each of the standards in each of the three color directions. We compared these PSEs to those predicted by different measures of saturation defined in the CIECAM02, HSV, DKL, LAB, LUV, and xyY color spaces. Our data suggest that the measures differ in their ability to predict human perception of saturation. On average, the measure defined in LUV fits perception of saturation best, while the measures defined for CIE space performed worst.

## **Cerebral correlates of faking the implicit association test**

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Direct assessment of attitudes towards socially sensitive topics suffers from deception attempts. Reaction-time based indirect measures like the Implicit Association Test (IAT) are less susceptible to such biases, but can be faked too. For faking both positive and negative attitudes we present high-density EEG data, showing characteristic ERP differences. In a first study, we randomly assigned 20 participants (15 females,  $24.65 \pm 3.50$  years old) to a counterbalanced repeated-measurements design, requesting them to complete a Brief-IAT (BIAT) on attitudes towards doping without deception instruction, and with the instruction to fake a positive and a negative doping attitude. Cerebral activity during BIAT completion was assessed using high-density EEG. Event-related potentials during faking revealed enhanced frontal and reduced occipital negativity, starting around 150ms after stimulus presentation. Further, a decrease in the P300 and LPP component was observed. Source analyses revealed enhanced activity in the right inferior frontal gyrus during faking, thought to reflect the suppression of automatic responses. Results indicate that faking alters very early brain processes and determines the cortical sources. Analyzing the EEG helps to uncover response patterns in indirect attitude tests and broadens our understanding of the underlying processes.

## **The SCAN Model: Predicting Temporal Dynamics of Eye Movements during Memory Retrieval**

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In this study eye tracking is used to trace processes during recall of information stored in long term memory. When recalled information is associated with external spatial cues, these cues provide an aid in activating information ('looking at nothing'). Depending on the stage of the recall process, predictions concerning shifts of attention towards spatial cues are therefore possible. Derived from well-established memory theories, the Serial Cue Attention Network (SCAN) model is introduced. Building on assumptions of associative binding and probabilistic recovery, it models shifts of attention, when information is successively cued. To test the SCAN predictions, 40 participants were required to learn six objects by heart. During encoding, each object provided a common spatial frame, holding four features in distinct spatial positions, and the order of encoding was manipulated (between). During the recall of an object, the emptied frame was presented, and eye movements were recorded. Spatial and temporal distributions of attention indicate a probabilistic activation procedure within an associative memory network, and a congruency between the order of encoding and recall. The eye tracking results highly match the predictions of the SCAN Model, which provides a promising perspective on measuring cognitive processes of probabilistic information activation during recall.

**Distracting distraction: Performance in the audio–visual distraction paradigm  
is modulated by irrelevant background sound**

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Performance in an ongoing task can be disturbed by irrelevant changes in the sensory environment. These distraction effects are a consequence of automatic processing and subsequent allocation of attention by the neuro–cognitive system. Corresponding performance effects have been studied in two different lines of cognitive research either using single auditory tokens (distraction paradigm) or multiple–token sequences, e.g. continuous background speech (irrelevant sound effect). The present study brings these lines of research together by testing whether sensory distraction by a single auditory–perceptive token is modulated in the presence of irrelevant background sound. Therefore, thirteen participants performed a visual odd–even discrimination task. Here, the digits were preceded by a short tone which was either presented with a standard or a deviant pitch (audio–visual distraction paradigm). In line with the typically reported effects, the rare deviant tone resulted in a slowing of the responses in the odd–even decision (sensory distraction effect). This effect was given independently of whether participants performed the task in a sound–free control condition or during background speech. In the latter condition, however, there was a trend for enhanced performance on standard tones (non–deviants). This might indicate enhanced task engagement during adverse environmental conditions as recently reported by several studies.

**Letters in the forest: global precedence effect disappears for letters  
but not for non–letters under reading–like conditions**

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Normally skilled reading involves special processing strategies for letters, which are habitually funneled into an abstract letter code. On the basis of previous studies we argue that this habit leads to the preferred usage of an analytic strategy for the processing of letters, while non–letters are preferably processed via a holistic strategy. The well–known global precedence effect (GPE) seems to contradict to this assumption, since, with compound, hierarchical figures, including letter items, faster responses are observed to the global than to the local level of the figure, as well as an asymmetric interference effect from global to local level. We argue that with letters these effects depend on presentation conditions: only when they elicit the processing strategies automatized for reading, an analytic strategy for letters in contrast to non–letters is to be expected. We compared the GPE for letters and non–letters in central viewing, with the global stimulus size close to the functional visual field in whole word reading (6.5° of visual angle) and local stimuli close to the critical size for fluent reading of individual letters (0.5° of visual angle). Under these conditions, the GPE remained robust for non–letters. For letters, however, it disappeared: letters showed no overall response time advantage for the global level and symmetric congruence effects (local–to–global as well as global–to–local interference). We interpret these results as according to the view that reading is based on resident analytic visual processing strategies for letters.

**The influence of motivation on cognitive control: Event-related potentials (ERPs) reveal differential incentive effects in younger and older adults**

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Temporal differences in updating goal-relevant context information are assumed to underlie age differences in cognitive control. As goals differ in their motivational value, the study investigated the effect of motivational cues indicating monetary gains and losses on the time course of context processing reflected in ERPs. To this end, we applied an AX-CPT in younger and older adults, requiring the updating of contextual cues on context-dependent, but not on context-independent trials. The behavioral data revealed age differences in context updating in latencies and error rates. Gain cues fastened latencies in younger, while both gain and loss cues slowed responding in older adults. In the ERP data, larger P3b amplitudes of context updating were found on context-dependent than -independent trials in younger adults, while older adults showed larger P3b amplitudes whenever contextual cues switched irrespective of the need for context updating. Potential losses caused cautious updating (reflected in the P3b), followed by an increased N450 of conflict processing in younger adults. In contrast, P3b-data in older adults indicated sharpened representations of context conditions during both gains and losses. Hence, the study shows age differences in context representations and the time course of context updating which were modulated by differential effects of gains and losses in the two age groups.

**The resources needed to implicitly monitor the mental states of others**

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CANCELED

Eye movements in ‘Sally-Anne’ False Belief tasks appear to reflect the ability to implicitly monitor the mental states of others (‘Theory of Mind’ – ToM). It has recently been proposed that an early developing, efficient and automatically operating ToM system subserves this ability. A surprising omission in the literature however, is an empirical test of the influence of domain-general executive processing resources on this implicit ToM system. I will present two studies in which a dual-task method was employed to investigate the impact of executive load (working memory load [study 1] and language production [study 2]) on eye movements in an implicit ‘Sally-Anne False Belief’ task. Under ‘no-load’ conditions, adult participants displayed eye-movement behavior consistent with implicit belief processing, whereas evidence for belief processing systematically decreased with the increase of working memory load as well as language production load. These findings indicate that the cognitive system responsible for implicitly tracking beliefs draws at least minimally on executive processing resources. Thus, even the most low-level belief analysis process appears to reflect a capacity-limited operation.

**Electrophysiological evidence for an active suppression of irrelevant mental representations  
in visuo-spatial working memory**

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We investigated the influence of irrelevant working memory representations on further information processing. A retro-cue indicated if the items on the left or right side of a previous memory array remained relevant. Subsequently, a central probe item was presented and participants had to state whether this stimulus was shown on the relevant side of the memory array. The probe was either a relevant memory item (“relevant probe”), irrelevant memory item (“irrelevant probe”) or was not shown in the previous memory array (“new probe”). While the same response was required, the “irrelevant probe” condition featured delayed response times referred to the “new probe” condition. Thus irrelevant working memory representations conflicted with the processing of the probe material. EEG data were used to examine the processing stages involved in the processing and resolution of this conflict and revealed a left-frontal activation prior to response that was increased for irrelevant compared to new probe items. This effect was accompanied by an increased posterior positivity for irrelevant probes compared to new probes subsequent to response. These results suggest that additional top-down control is required to actively suppress the residual representations of irrelevant information in working memory and support the selection of required responses

**Cross-gender differences in comprising the size of the female breast  
in weight estimations of female bodies**

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Previous research has revealed a strong relationship between mere visual cues (e.g. the perceived body shape) and the human body weight. Actually, such cues can be employed to validly judge the weight of human bodies. In the present study we examined the impact of the size of the female breast as a visual cue on weight estimations across gender. Within such a cross-gender design we are able to assess the relative importance of such cues for both genders. In a first experiment participants judged the body weight of 12 frontal presentations of naked female bodies, which were manipulated in terms of the size of the breast (smaller or larger breast size plus the original breast size). Body weight estimations were biased by breast size for both gender groups, but male observers showed an even much stronger bias than female observers-- smaller breast sizes produced much lower and larger breast sizes produced much higher weight judgments, significantly exaggerating the mere effect of the weight of breast. In order to analyse these gender-related effects further, we conducted a second experiment with limited presentation times (50 and 200 ms) and compared the regarding weight estimations with unlimited presentation times of the same bodies.

## **Neural Signatures of Face Encoding Predict Social Influence on Attractiveness Judgments**

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Behavioral studies indicate that social conformity is related to a person's current style of cognitive processing. People who process judgment-relevant information in a superficial, heuristic way are more likely to conform to group judgment than people processing this information in a systematic and elaborate way. To test this notion at the level of neural activity, we used event-related brain potentials and investigated whether the strength of encoding of faces was related to the tendency to adopt a group's evaluative judgments regarding these faces. Our hypothesis was confirmed, as the amplitude of the N170, a well-known signature of structural face encoding in occipitotemporal brain areas, was inversely related to conformity across participants: The weaker the faces were encoded, the more the group's ostensible average response regarding the faces' attractiveness was adopted instead of relying on the actual qualities of the faces. Combining neurophysiological and behavioral methodology, we thus support and extend the idea that social conformity is a heuristic type of judgment. We propose that the strength of basic encoding of the to-be-judged item is of vital importance, as weak encoding either facilitates or even necessitates socially adjusted judgment.

## **The Implicit Cognition of Lying**

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In our daily interactions we often find ourselves lying to be liked or accepted. Having lied, it is important to remember situations in which we lied because being unmasked leads to social exclusion. Drawing on instance-based theories of automaticity, we hypothesized that knowledge about having lied is retrieved automatically from long-term memory when certain stimuli of the situation are encountered again. In two experiments, participants were instructed to lie to a subset of questions in an oral interview. Subsequently, they had to categorize the words "honest" and "dishonest" in a speeded classification task. Before the classification decisions, either questions of the interview or pictures of the interviewers were shown as task-irrelevant primes. In experiment 1, classification of the target "dishonest" was faster when the prime was a question that participants had answered untruthfully before. In experiment 2, participants responded faster to the target "honest" when being primed with the picture of an interviewer whose questions they had answered truthfully. The results indicate knowledge about lying and truthful responses is retrieved automatically from memory.

**Using custom-made masking functions to produce dissociations  
between masking and response priming: Does it really work?**

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According to the double dissociation paradigm (Schmidt & Vorberg, 2006), motor priming effects occur with increasing SOA no matter whether the prime visibility increases or decreases. The presence of such opposites effects indicates that visual perception and visual awareness are independent and not controlled by a single source of conscious information. We employ a response priming paradigm where participants respond as quickly and accurately as possible to visual targets preceded by masked primes. The masks comprise prime-based features – horizontal and vertical ellipses – and their intensity is systematically coupled with SOA such that masking either increases or decreases as a function of SOA. We find that these different masking functions have a strong impact on visual awareness of the prime, but that their impact on response priming effects is much smaller. More specifically, mask intensity is of importance only for shorter SOAs, but not for longer SOAs. In a second experiment, we compare this effect to a situation with neutral mask features (white noise). We discuss the possibility of masking effects on early response activation, especially at short SOAs, as well as the usefulness of our technique for creating double dissociations between priming and masking.

**Facilitative effects of inhibitory stimulation: Space–number associations in the prefrontal cortex**

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Transcranial direct current stimulation (tDCS) is a neuromodulatory technique that allows for transient shifts of neural activity. Here, we use tDCS to examine the neurocognitive underpinnings of space–number associations. The SNARC (Spatial–Numerical Associations of Response Codes) effect describes that larger numbers are responded to faster with the right hand and smaller numbers with the left hand. Its origin is, however, controversial. While some authors favour the view that it indexes a representation of an oriented mental number line (subserved by the intraparietal sulcus IPS), other suggest that it is driven by working memory and cognitive control (subserved by the dorsolateral prefrontal cortex DLPFC). In this study, we examined the role of the DLPFC for the SNARC effect and the Simon effect in a magnitude–irrelevant and position–irrelevant task (parity and colour judgment, respectively). Cathodal, inhibitory stimulation of the dorsolateral prefrontal cortex, which has been demonstrated to reduce WM capability, dissociated the SNARC effect from the Simon effect and thereby provides evidence for a WM account of spatial–numerical associations. Further, the effect was driven by faster responses to incongruent targets only, revealing the deflective character of number–space associations in parity judgment. Implications for the possible working mechanisms and applications of cathodal tDCS in the cognitive system and the neurocognitive mechanisms underlying the SNARC effect are discussed.

## **The monocular Simon effect is influenced by both accessibility of eye-of-origin information and task requirements**

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Participants usually respond faster and more accurately when a target stimulus is presented in the same relative location as the response, even if the location of the target stimulus is task-irrelevant (standard Simon effect). A similar stimulus-response compatibility effect can be observed for stimulated eye and response location, even if eye-of-origin information is not consciously accessible (monocular Simon effect). The present study examined to what extent accessibility of eye-of-origin information and task requirements influence the monocular Simon effect. In a within-subjects design, stimuli were always presented monocularly and participants performed both a simple and a choice reaction time task. Accessibility of eye-of-origin information was manipulated using a mirror stereoscope. Stereoscopic presentation resulted in a centrally perceived stimulus location (eye-of-origin information inaccessible) whereas non-stereoscopic presentation resulted in a laterally perceived stimulus location (eye-of-origin information accessible). In the simple RT task, a monocular Simon effect was observed only if eye-of-origin information was accessible. In the choice RT task, a monocular Simon effect occurred irrespective of presentation condition. However, the effect was larger when eye-of-origin information was accessible than when it was not. The present results suggest that two types of spatial stimulus information contribute to the monocular Simon effect.

## **Measuring and Predicting Risk-Taking in a Real-Life Traffic Task**

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Increased risk-taking behavior in traffic is a major cause of accidents. Past research has shown that risk-taking behavior in traffic can be partly predicted by situational factors as well as personality measurements. However, cognitive processes underlying risk-taking behavior in traffic are largely unexplored. In order to find out more about a possible trait-like risk-taking propensity in traffic risk behavior, the presented project is evaluating the connection between a behavioral laboratory risk task and real-life traffic risk-taking. 50 Participants were tested for their risk-taking behavior in the Balloon Analogue Risk Task, two behavioral traffic risk taking tasks and reported their traffic history in a questionnaire. Results show, that when controlling for the experience in traffic, risk-taking in an abstract laboratory risk task can be predictive for real-life traffic risk-taking.

## Revealing the Train of Thought: Inferring Cognitive Processes from Process Measures

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Inferring cognitive processes from observational data is a central element in the study of cognition. However, observed patterns may be misattributed to cognitive processes. In the neuroscience literature, this is commonly referred to as reverse inference. We introduce a new method called “instructed process tracing”, by collecting eye–movement data from participants instructed to proceed in line with either expected value theory, a lexicographic heuristic, or without being given specific instructions. We found closer similarity of the no–instruction condition to the expected value condition in terms of acquisition patterns and attention to specific features of the gambles. Comparisons of acquisition sequences favored the lexicographic heuristic. However, our data provided no support for common assumptions—for example, of attention being equally distributed between outcomes and probabilities in expectation models. Our approach could serve as an indicator of reverse inferences outside neuroscience and help to improve the quality of inferences made about cognitive processes on the basis of observational data.

## Advice Taking in Groups and Individuals

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A recent debate has revolved around the question how well groups – compared to individuals – make use of advice in a so–called judge–advisor system. In two experiments, we compared the advice taking behavior of 2–person groups to that of individuals. We found that groups consistently weighted the same advice less than individuals. However, this behavior is appropriate only under the assumption that group members combine their independent knowledge and opinions to form the initial group judgment because, in this case, group judgments are bound to be more accurate than those of individuals. Our data suggest that groups made use of advice as if their initial judgments were a combination of their members’ independent opinions, although they were generally not. Initial group judgments were no more accurate than those of individuals, that is, groups did not make use of their increased cognitive resources. The exception was a condition in which group members were explicitly asked to provide independent individual judgments prior to making the initial group judgment; this procedure enabled them to provide more accurate judgments than individuals. In sum, groups seem to act under the assumption that their consensus judgments are an aggregate of their members’ independent opinions, but fail to recognize when this condition is not met.

## Active function learning as Gaussian Process optimization

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How can and should an agent actively learn a function? Psychological theories about function learning are vast, but currently there is no real theory about how humans actively acquire knowledge about continuous input–output relations. We try to develop a theory of active function learning based on Gaussian Processes, a non–parametric class of regression models that can learn functions in a close to–rational manner. It will be shown how Gaussian processes can be used to explore and exploit stationary functions based on greedy algorithms and mathematical properties of these algorithms will be stated. Moving on, two generalized algorithms that allow many classes of models to be utilized within exploration/exploitation scenarios will be introduced. All of the stated models will then be tested at how well they can explore or exploit a 2–dimensional function in an a priori simulation study. Afterwards, 2 different experiments will be introduced in which human participants had to explore or exploit the different 2d–functions. It will be shown that Gaussian Processes can indeed provide a powerful tool to model human active function learning, beating all of the alternative models in every single experiment.

## Be aware of odors: Odor awareness has an influence on the emotionality of odors

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Odor awareness includes the perception and reaction towards odors and differs between humans. Some individuals are more aware of odors than others. Individuals that percept and react towards odors faster and stronger are more aware of odors in their environment and are able to detect a single odor against a background of other odors and stimuli. With only two synapses between the olfactory neuron and the amygdala, there is a strong link between olfaction and emotion. The Semantic Differential (Bradley & Lang, 1994) was used to measure the perceived emotional quality of 22 different odors to analyze the relationship between odor awareness (using the odor awareness scale – Smeets, 2008) and the emotionality of odors. Individuals with a high awareness for negative odors perceive unpleasant odors as more dominant than pleasant odors. Individuals with a high awareness for positive odors perceive both unpleasant and pleasant odors as equally dominant. A higher awareness for negative odors seems to put unpleasant odors more into the focus of attentions. The difference in odor awareness leads to a different perception of the environment regarding olfaction and emotion.

### **Subliminal primes elicit independent motor responses**

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EEG experiments have demonstrated that prime and target stimuli elicit independent, lateralized readiness potentials (Klotz et al. 2007). Evidence suggests that subliminal primes not only initiate readiness potentials. Incongruent primes even elicit erroneous early motor responses. Response amplitudes increase with the temporal distance (SOA) between prime and target (Schmidt 2002). We asked whether the erroneous early responses were independent responses to the prime, which were overwritten by subsequent target responses. To this end, twenty-four participants had to execute a choice-reaction task. Target pictures of a basketball player passing the ball past the left/right side of the participants were presented. Participants executed a 'blocking movement' to the pass side. The shift of their centre of mass was measured. Targets were preceded by primes with three different SOAs, depicting the same player, but congruent or incongruent pass and gaze directions (3x2x2 design). Independent response curves for prime and target stimuli were calculated by averaging selected factor combinations. The measured response curves for all factor combinations could be reconstructed as an additive combination of the prime and target responses with a respective SOA shift. This supports the idea that both the prime and target stimuli elicit independent responses executed by the motor system.

### **Delay does not influence the spatial representation of serial reach targets**

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It has been argued that the brain primarily relies on egocentric metrics, especially target position relative to gaze, when executing immediate reaches to a single remembered target location. When reaching is delayed, the visuo-motor system presumably relies stronger on allocentric (i.e., object-centered) metrics. However, previous results from our lab indicate that reaches to single remembered targets are still represented relative to gaze when static visual landmarks are available and reaching is delayed by up to 12 seconds. Based on a previous study which showed a stronger contribution of allocentric coding for sequential reaches, we tested in the present experiment whether a delay of 0, 5 or 12 seconds influences the use of a gaze-dependent reference frame when reaching to two remembered targets in sequence. Therefore, the first target could serve as a landmark for the second reach. We found that subjects combined both representations when planning their reaches, with a stronger influence of allocentric information. However, the relative contributions of egocentric and allocentric reference frames did not change with the amount of delay. These findings suggest that delay does not influence the relative contribution of egocentric gaze- and allocentric landmark information, even when possible landmarks are reach goals themselves.

## **Dont blame the players – blame the roles! Moralische Rollen in normativen Konflikten.**

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Wie reagieren Menschen, wenn sie Zeugen eines moralischen Vergehens, also einer Verletzung von Anstands-, Verteilungs- oder gesetzlichen Normen werden? Bisherige Forschungen haben bei dem Versuch, diese Frage zu beantworten, meist eine individualistische Perspektive eingenommen (und beispielsweise nach Persönlichkeitsvariablen als Verhaltensprädiktoren gesucht) und/oder sich auf die Vorhersage bestimmter Verhaltensweisen (bspw. „Bystander-Apathie“) konzentriert. Ziel des hier zu beschreibenden Forschungsprogramms ist es, die Vielzahl möglicher Reaktionen auf beobachtete normative Konflikte systematisch zu klassifizieren. Dabei wird auf das Konzept „moralischer Rollen“ zurückgegriffen. Zunächst soll (im Rahmen einer qualitativen Befragung) untersucht werden, welche Rollen sich aufgrund spezifischer Kognitions-Emotions-Verhaltensmuster sinnvoll differenzieren lassen. In einem zweiten Schritt soll (im Rahmen laborexperimenteller Studien) untersucht werden, inwieweit die Übernahme einer bestimmten Rolle Prozesse des Denkens, Fühlens und Handelns einer Person beeinflusst. So lässt sich aus Rollentheorien unter anderem die Hypothese ableiten, dass rollenspezifische Attribute nach der Rollenübernahme (aber nicht vorher) stärker mit dem Selbstkonzept verknüpft sind und dass die Übernahme einer Rolle mit einer subjektiv erlebten Einschränkung verfügbarer Handlungsoptionen einhergeht. Im Vortrag werden die theoretischen Argumente, die diesen Hypothesen zugrunde liegen, hergeleitet und begründet; außerdem werden Designs zu ihrer Überprüfung vorgestellt.

## **The Being a Patient effect – Group labelling affects patient performance in clinical research**

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By comparing a patient group with a well-matched healthy control group, patient studies provide fundamental insights into a disease's mechanisms. This procedure seems a fairly straight-forward process, allowing experimenters to gauge the effects of a particular disease on cognitive and physiological measures, motor performance, and others. But what if the differences found by this approach are not only caused by genuine effects of the disease, but also by a psychological component that only affects the patient group: the knowledge of being a patient (BP effect)? In the present study, we investigated whether labelling a participant group as “patients” – thus evoking negative performance expectations – affected physiological measures and performance in higher cognitive functions. To this end, we invited 48 participants diagnosed with mild allergies and randomly assigned them into a patient or a control group. Although the groups only differed in group labelling, not in actual symptom severity, patients showed lower pain thresholds than controls, as well as decreased performance in easy arithmetic tasks. These results provide a first clear-cut demonstration of a BP effect and indicate that current clinical studies might systematically overestimate actual disease effects by not addressing this psychological component.

## **Is System Thinking Evolutionary Adaptive?**

### **The Impact of Survival Relevant Context on Understanding Stock Flow Systems**

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A growing number of empirical findings show that even very simple dynamic systems, so called stock flow (SF) systems, are rather poorly understood by lay people (Cronin, 2007; Ossimitz, 2002; Phuah, 2010; Schwarz, Epperlein, Brockhaus & Sedlmeier, 2013). As yet, approaches to improving SF-understanding by more appropriate illustrations have failed to bear a noticeable impact on performance in SF-tasks. However, recent studies in evolutionary psychology have indicated that specialized cognitive mechanisms might have evolved to process information that is vital to individual survival. Some of these studies reported improvements in memory (Nairne & Pandeirada, 2011; Nairne, Thompson, & Pandeirada, 2007) and problem solving (Garner & Howe, 2013) if information was presented in a context relevant to survival as compared to other contexts. Based upon these findings, the present study investigated the impact of a survival-relevant context on the understanding of SF-systems. Participants were randomly assigned to two conditions: survival priming and SF-tasks in a survival context or pleasantness priming and SF-tasks in a non-survival context. Although the memory improvement in the survival context could be replicated, the experimental manipulation did not affect SF-understanding. The results are discussed in regard to previous findings, possible explanations and theoretical implications.

### **Examining visual working memory and aging by varying the retention-interval length:**

#### **Evidence for an age-related delay in filtering**

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The capacity of visual working memory (WM) declines with age. Research focusing on the underlying factors revealed that the ability to filter out irrelevant information (i.e. filtering efficiency) seems to be a critical factor for variations in WM performance. However, in experiments using event-related potentials (ERPs) an age-related delay in filtering was found rather than a general impairment: In a visual WM task (change-detection task) where target and distractors were presented, older adults showed a filter deficit that was restricted to the beginning of the retention interval. In the present behavioral study we used a similar task, but additionally varied the length of the retention interval. We observed that older adults WM performance for targets are particularly affected by irrelevant information when the retention interval is short. WM-equated young adults did not show this effect. The results indicate that older adults represent more irrelevant information early in the retention interval, which is in line with the delayed filtering found in previous ERP experiments. These results will be discussed with respect to theories assuming different selection mechanisms used by young and older adults to control the content of WM.

**Testing two explanations of the testing effect in vocabulary learning:  
retrieval effort vs. transfer–appropriate processing**

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Recall during the study phase results in better long–term retention than solely studying. We test two explanations of this testing effect, retrieval effort (RE) and transfer–appropriate processing (TAP). 62 participants learned German–Swahili vocabulary pairs: after an initial study cycle, one third was cued with the Swahili word and retrieved the German word, one third recalled the Swahili word, and one third further studied the pairs. After one day, participants recalled the German words for half the items and the Swahili words for the other half. According to RE, the testing effect is a function of the difficulty of retrieval. Thus, practicing retrieval of Swahili words should be most beneficial, irrespective of the type of final test. TAP attributes the effect to the overlap between processing at study and at test. Therefore, performance in the Swahili final test should be best for the Swahili recall group and for the German recall group in the German final test. We obtained a significant interaction between learning condition and test type: The Swahili group recalled more Swahili words than the German group, but the German group outperformed the Swahili group in the German final test. This indicates that TAP better explains the testing effect for vocabulary learning than RE.

**Posture vs. location recall: manual asymmetries in frames of reference?**

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Motor plans are not generated from scratch for each movement but may be recalled for subsequent movements. For the dominant right hand, the information used for grasp recall seems to be represented in an extrinsic (object–centered) rather than intrinsic (body–centered) frame of reference. This study examined whether the frame of reference for grasp recall depends on the hand used to perform the task. Participants grasped a plunger from a home platform (90cm high) and transported it to a target platform (50cm, 90cm, or 130cm high), using either their dominant right or non–dominant left hand (first moves). After bringing their hand back to the side, participants returned the plunger to the home platform using the same hand (return moves). To dissociate between body–centered and object–centered recall, participants took a sideways step between the first and return moves where they stepped onto a platform, down from a platform, or merely horizontally. Return move grasp heights were much more similar to the first move grasp heights for both the dominant and non–dominant hand, when analyzed relative to the plunger base (extrinsic coordinates) rather than to the feet (intrinsic coordinates), hence providing evidence for an effector–independent and object–centered frame of reference for grasp recall.

### **Do alerting signals broaden the attentional beam?**

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Several recent studies show that an alerting signal (AS) increases distractor interference in conflict tasks. To shed further light on the underlying mechanism, we investigated whether an AS broadens the beam of spatial attention and thereby advances distractor processing. Our participants performed two tasks: In the majority of trials (main task), we presented a five-item array in which the response-relevant item always occurred at the middle position, thereby centering participants' attention on the middle position. In some trials (probe task), we presented a probe array in which the response-relevant item occurred at any of the five positions. Here, reaction time (RT) as a function of the probe's position provided us a measure of the size of the attentional beam. Half of the trials contained an AS preceding the array. As expected, RT was faster in the presence of the AS. Furthermore, probe-RT varied as a function of the probe's position, being fastest at the middle position and increasing to lateral positions. Most importantly, the AS did not flatten the probe-RT function. This result is at variance with the hypothesis of a broadened attentional beam, but is consistent with nonspatial accounts of the AS effect.

### **Driving Anger among Taxi Drivers in German Cities**

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While vehicles have successively become more user friendly and safe through research in the automotive sector, human factors are still remaining the most common cause of accidents on roads, not only in Germany. Traffic psychological research shows that maladjusted driving behavior caused by affective states is a main contributor to traffic accidents. Our current study takes a closer look at the issue of driving anger among taxi drivers in German cities. Former studies mainly focused on private drivers' anger. To gain more specialized insights in this issue, professional drivers should also be considered. Therefore, our study questions whether German taxi drivers' experiences as professional drivers affect as well their experience of driving anger. In a questionnaire study comprising, inter alia, the Driving Anger Scale and the State-Trait Anger Inventory, 138 taxi drivers were compared to 423 non-professional drivers. Results showed that taxi drivers experienced less driving anger. Nevertheless, they were disposed to perceive a certain amount of anger, especially when it comes to other drivers' discourteous behaviour. Within the taxi sample, large inter-individual differences turned out: High-anger taxi drivers reported more driving anger and violations in traffic. However, a connection between driving anger and accident involvement was not found.

## Stability of Individual Parameters in a Computational Model of Optimal Fact Learning

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One role of computerized tutoring systems is to optimize the learning of factual materials. Over a hundred years of memory research have identified two robust effects that can improve such systems: the spacing and the testing effect. By making optimal use of both of and adjusting the system to the individual learner, such systems streamline learning. One such system has been recently developed and consistently outperforms the traditional flashcard methods (Nijboer, 2012; Van Rijn, Van Maanen & Van Woudenberg, 2009). As of now, however, user-specific characteristics are estimated to optimize each learning session but are not preserved between sessions. In this study, we investigate to which extent user-specific characteristics are stable over time and across different materials to gauge to which extent they can be preserved between sessions. Seventy-six participants studied four types of material in three sessions that were spaced one week apart. The stability of the model's estimated rates of forgetting for each participant were compared across time, all correlations  $>.75$ , indicating stability within domain over sessions, and materials, correlations ranging from  $.38$  for dissimilar to  $.86$  for similar materials, indicating that different domains might result in different individualized learning parameters.

### **The ndl package: a tool for computational models of discrimination learning.**

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We introduce a naive discriminative learning (NDL) model, based on the Rescorla–Wagner equations, and simulated using the equilibria approximation proposed by Danks (2003). NDL allows the consequences of accumulated experience in lexical processing to be explored with realistic data samples. This means learning to use thousands of cues to discriminate tens of thousands of outcomes. When used to model language processing, it can be trained on corpora ranging from tens of millions of words to several billions of words. It fully supports the Unicode standard, allowing it to model almost any language. Our implementation of NDL is released as a package that is freely available for the open-source R statistical computing environment.

## Comfortable Time Headways under Different Visibility Conditions

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In this experimental study we investigated the influence of different visibility conditions on time headways perceived as comfortable in vehicles equipped with an advanced driver assistant system. Participants were presented with 72 different driving situations, in which the car drove autonomous. Each situation lasted 10 seconds and was varied in speed (50, 100, 150km/h), time headway (0.5–4.0 seconds in 0.5 second increments) and visibility. Visibility in the driving situation was varied three-fold. In condition no.1, participants followed a normal sized car. In condition no.2 participants followed a truck that occluded the view on the lane ahead and in condition no.3 participants followed a normal sized car but fog was introduced, limiting the visibility of the driving environment around the driver. During the different driving situations, perceived levels of comfort regarding the distance to the car in front were rated by adjusting a haptic lever. In all speed conditions, participants only reported a decline in comfort for time headways below a critical threshold. This threshold differed with the three visibility conditions. Results of this study will be discussed in terms of their impact on theoretical issues, i.e., driver behavior models, and applied issues, i.e., the design of adaptive vehicle automation.

## Feature priming rather than visual working memory affects oculomotor selection in a bottom-up manner

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CANCELED

It has been demonstrated that objects held in working memory can influence rapid oculomotor selection. This has been taken as evidence that initial perceptual salience can be modified in a top-down fashion (e.g. Hollingworth, Matsukura & Luck, 2013). The goal of the present study was to examine whether these results could be better explained by feature-based bottom-up priming. In two experiments, participants were asked to saccade to a target line segment that was presented together with a to-be-ignored distractor. Both objects were given a task-irrelevant color that varied per trial. In a secondary task, a color had to be memorized, a color that either matched the target, the distractor, or none of the objects in the eye movement task. The memory task was completed either after the eye movement task (Experiment 1), or before (Experiment 2). The results showed that memory content biased oculomotor selection, an effect that was more pronounced for short-latency saccades. Crucially, this effect was similar in both experiments. This suggests that bottom-up feature priming rather than the active maintenance in VWM is the driving force behind early biases in oculomotor selection.

## Impact of creativity, selective attention and automatic execution on visuomotor adaptation: processing stages in skill acquisition?

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A learning model proposed by Chein and Schneider (2012) is based on neuroimaging studies and proclaims three stages of learning. Each stage is associated with certain brain regions and cognitive abilities: the first (formation) stage with creativity, the second (controlled execution) stage with selective attention, and the third (automatic execution) stage with the ability for automatic processing. To scrutinize the validity of this model for visuomotor adaptation, subjects completed an adaptation task (pointing with 60° rotated visual feedback) and additionally performed tests for creativity (ATTA), selective attention (Stroop) and automated processing (four-choice reaction time). To examine the relationship between cognitive abilities and motor learning at different times of practice, associations between cognitive and adaptation scores were calculated throughout adaptation. We found that good performance on Stroop and 4-choice-RT task was beneficial for adaptation. In contrast, ATTA scores were not related to adaptation. Associations between Stroop performance and adaptation decreased, while that between 4-choice-RT performance and adaptation increased throughout the process. Our data support the application of Chein and Schneider's model only in part. We can confirm an earlier controlled-execution stage and a later automatic-execution stage, but found no evidence for an initial formation stage related to creativity.

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## Investigating the Other-Race Effect using Multinomial Processing Tree Models

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The other-race effect (ORE) refers to the phenomenon that recognition memory for other-race faces is worse than for own-race faces. We investigated whether White Germans exhibited an ORE towards Turkish/Arabic faces using a multinomial processing tree model (MPT), the two-high threshold model of recognition memory with three response categories (old, unsure, and new). Using an MPT enabled us to adequately disentangle memory and response processes using the Fisher information approximation, a minimum description length based measure of model complexity. Results showed that participants exhibited an ORE primarily on the memory parameters.

## **Finger posture priming of number representations across modalities**

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The present study compares effects of visually presented and manually adopted finger counting postures on number processing. In different blocks of the experiment, 30 participants saw pictures of finger postures (visual condition) or they adopted finger postures (motor condition) while indicating via foot responses whether an auditorily presented target number was smaller or larger than five. We expected two kinds of congruency effects between the numbers represented by finger postures (F) and target numbers (T): an exact congruency effect (F=T) and a magnitude congruency effect (F,T<5 or F,T>5). Our results revealed an overall exact congruency effect: foot responses were on average given faster by 16ms ( $t(29)=2.62$ ,  $p=.01$ ) when F=T. Interestingly, we found a significant magnitude congruency effect for the motor condition (13ms;  $t(29)=2.16$ ;  $p=.04$ ) but not for the visual condition. Our findings support an embodied approach, according to which finger counting postures automatically activate the agent's number representations. They further suggest that numerical priming from seen finger postures is predominately mediated by motor codes.

## **A simulator study of investigating the effects of different worksites on driver behavior**

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A large part of German motorways is increasingly overaged and in need of maintenance. Thus, many worksites for road preservation and development are already installed and even more are planned. However, the human factor is only considered poorly. The aim of the presented study was to investigate how drivers' state is modified, behavior-related and emotional, when confronted with different challenges due to construction works. In the study, three worksites were selected, differing in length, staggered arrangement and design. Eye-tracking data and the driving behavior were investigated by recording speed and distance to other vehicles, breaking behavior and standard deviation of lane position. Current traffic conditions were additionally documented. The combined captured data allow a detailed evaluation of the different driving episodes, the drivers' behavior and the effects of worksites on road users. To capture the road users' subjective attitude, questionnaire data were additionally collected. Based on the findings, recommendations for the installation and arrangement of worksites will be compiled which lead to considerations to the driving behavior. Overall, the strains for road users in areas of worksites are thereby to be reduced and a reduction of accidents is to be achieved.

## **Embodied Learning Using a Tangible User Interface: The Effects of Haptic Perception and Interaction Mode on Learning, Cognitive Load, Motivation, and Usability**

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Tangible interfaces offer new ways of interaction with virtual objects, yet little research has been conducted on their learner-friendly design in the context of spatial learning. Although frameworks such as embodied cognition stress the importance of movement and discovery by action, studies have found that high interactivity can be overwhelming and may lead to a lower learning performance. In a 2x2 factorial design participants learned heart anatomy using a 3D model that was either controlled using a mouse or a tangible proxy object, i.e. a motion tracked plastic model of the virtual heart. Secondly, we varied the interaction mode featuring either static label displays or an interactive mouse-over mode that only displayed the label that the user currently activated. Retention performance, cognitive load scores, and motivation measures indicate that the tangible proxy object leads to significantly higher learning outcomes. The effect of the interaction mode is dependent upon the input device: the mouse-over feature has a beneficial effect for mouse users, while it resulted in lower performance and higher cognitive load with the proxy object. Based on these results, we propose extensions for embodied cognition and cognitive load theory.

## **Fronto-temporal prediction optimally tunes perception and learning of degraded speech**

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According to predictive coding accounts of human perception, the brain is constantly refining an internal model of the external environment by minimizing the error of its sensory predictions (Rao and Ballard, 1999; Friston, 2005). In this talk, I will present evidence from behavioral and M/EEG experiments of predictive mechanisms operating during perception and learning of degraded spoken words. I will show that accurate predictions from prior matching text enhance the perceived clarity of speech with concomitant modulation of activity in frontotemporal cortex. The magnitude, timing and directional connectivity of M/EEG responses in this brain network suggest that higher-level representations (of phonemes or words) in frontal cortex enable more accurate prediction of acoustic-phonetic representations in the superior temporal gyrus. Furthermore, I will show that these predictive computations not only modulate immediate speech perception but also longer-term perceptual learning. Thus, a single mechanism – fronto-temporal prediction – optimally tunes perception as well as learning of degraded speech.

## **The effect of stimulus novelty on the subsequent information processing: an ERP study**

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Two experiments were carried out in order to determine the effect of preceded familiar or unfamiliar stimuli (primes) presentation on the visual information processing (targets). In Experiment 1 we recorded ERPs in response to images of everyday objects (dog, hat, etc.) while participants were performing a classification task (animate or inanimate object). All this images were primed by two groups of unrelated primes: 1) images, earlier memorized by participants (familiar primes), and 2) images, presented at the first time during experiment (unfamiliar primes). Targets were presented for 400 ms, primes – for 325 ms, without any interval. The same procedure was applied in Experiment 2, but instead of earlier memorized or not memorized primes we used images of abstract (globally unfamiliar stimuli) or typical, everyday objects. Results of both experiments showed the decrease of N400 amplitudes for targets primed by unfamiliar images if compared to targets primed by familiar images. It is proposed that decrease of N400 amplitudes is connected with improvement of stimuli processing efficiency in identification tasks (Gotts et al., 2012). We interpret obtained results by inhibitory impact of familiar stimuli on non-related memory traces.

## **Women outperform men in distinguishing between real and fake smiles**

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Women tend to be more accurate in decoding facial expressions than men. We investigated whether this female advantage also applies to distinguishing between real and fake smiles. We showed participants of both sexes photos of persons displaying either a real or fake smile and asked them to correctly identify the type of smile. As predicted, women outperformed men in accurately identifying the smiles. The smiles differed in activation of the eye region but not the mouth region, supporting the idea that one mechanism for the female advantage is a greater attention to the eyes. The results were not due to variations in participants' mood or rejection sensitivity. We speculate that an evolutionary explanation for women's better performance is that identifying false smiles is helpful to identify untrustworthy suitors.

## **The effectiveness of two acute physical activity interventions on the inhibitory control of preschoolers**

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Physical activity is an important health factor. However, it also seems to be connected to cognitive functions. Despite the vast amount of research on the relationship between cognition and motor function, there are – especially for preschoolers – just a few experimental designs. Hence, it is still unknown which kind of physical activity is the most effective to facilitate cognitive functions or which kind of cognitive function profits most from physical activity. The aim of the present study was to explore the effectiveness of two acute physical activity interventions on the inhibitory control of preschoolers. The children were distributed into three groups, an endurance training group, a coordination training group and a control group. Every group performed four different tasks once within 15 minutes. The coordinative group performed bimanual tasks, e.g. throwing balls with both hands alternately. The endurance training group accomplished running and cycling tasks, whereas the control group attended non-physical active tasks, e.g. stamping. To control the intensity of the interventions, the children wore a heart rate monitor. For both physical activity groups a mean heart rate of about 140 beats per minutes was defined as target heart zone. The inhibitory control was tested one week before and directly after the intervention with a modified Flanker Task (Roebers & Kauer, 2009). The results revealed that children who participated in one of the physical activity interventions showed a significant gain in inhibitory control. Additionally, the effect of the interventions for children with low-inhibitory control at pretest will be discussed.

## **Prioritization strategies in continuous dual-task performance**

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In the reported experiment, Individuals performed a mental-addition and a memory-recognition task either separately or simultaneously (single-task vs. dual-task condition). Single digits were presented serially after each other to be added-up and/or to be memorized by the participants, depending on the experimental condition. We asked whether the individuals would be able to give priority to either the mental-addition task or the memory-recognition task by intention, or not. One prominent account proposes that available processing resources can be allocated in a flexible way to two concurrent tasks, so that any costs arising from dual-task (vs. single-task) processing should always be additive. In other words, the demand for resources of two tasks when performed together should equal the sum of the demands for the same tasks when performed separately. Another account proposes that the set-up of attentional priorities should result in extra costs so that costs under a dual-task (vs. single task) condition should be more than additive. Our results confirm the latter assumption, showing that dual-task costs are fairly additive in a natural (balanced-priority) condition, while prioritizing either of the task yielded extra costs. This demonstrates dual-task costs originating not from sharing but from the implementation and maintenance of attention-allocation policies.

**Neural correlates of reconfiguration failure revealed by single-trial analysis  
of EEG data in task switching**

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Switching between different competing tasks requires task-set reconfiguration –an important ability in goal-directed behaviour. In the present EEG study, we used a variant of the task-switching paradigm to identify neural correlates linked to failures of task-set reconfiguration. Participants performed a task in which two different types of error could be made: task errors, in which the incorrect task was erroneously applied, and response errors, in which the correct task was applied but an incorrect response was provided. By means of single-trial classification, we extracted a discriminative component representing task-set reconfiguration. This component could be used in a second step to distinguish task errors from response errors. It discriminated significantly between error-types in an early (~100 ms) and a late time period (~1100 ms) during the cue-stimulus interval. This suggests a pivotal role of these time periods in the emergence of reconfiguration failure with the earlier one being linked to failed cue processing and the later one being linked to insufficient reconfiguration.

**An interdependent self-construal facilitates self-control  
by increasing an interrelated perspective on temptations**

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We examine the hypothesis that one fundamental dimension of the self, namely the distinction between an interdependent and an independent self-construal, crucially affects self-control. In specific, an interdependent self-construal fosters holistic, interrelated information processing in general and might thus also lead to an interrelated perspective on temptations. Such an interrelated perspective on temptations has been shown to make the costs of indulging in a temptation more salient and, thereby, to increase self-control. In line with our hypothesis, Studies 1 through 3 demonstrate that a dispositional as well as temporarily activated interdependent construal of the self directly facilitates self-control. We investigate the role of this processing style more directly by showing that interdependent participants have a more interrelated perspective on temptations (Study 4), which in turn leads to better self-control (Studies 5a and 5b). Taken together, these findings demonstrate how self-construal – via its fundamental influence on information processing – shapes self-control.

## Exploring the Other-Race Effect in Working Memory

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People have great difficulties in remembering other-race faces. This so-called other-race effect (ORE) is a highly robust memory effect, which has been frequently replicated in old/new recognition tasks. According to recent theories, the effect is caused by the interplay of perceptual expertise and motivational factors, which lead to different processing mechanisms of own- and other-race faces. It is frequently assumed that such processing differences occur during encoding (e.g., categorization vs. individuation). If this holds true, we should be able to find evidence of the ORE already during earlier stages of information processing, preceding the standard ORE in long-term memory. Thus, we should, for example, observe a performance deficit for other-race faces in working memory. In order to test this hypothesis, we explored working memory performance in response to faces of participants' own vs. other ethnicity. We report the results of three experiments in which different working memory paradigms were implemented: a self-ordered pointing task (Petrides and Milner, 1982), an adaptive N-Back task and a Change Detection task (Curby and Gauthier, 2007) with inconsistent findings. We discuss if and to what degree this line of research can provide new insights on the processes leading to the other-race memory deficit.

## Workout your brain: Effects of motor-cognitive coordination training and cardiovascular training on cognitive functions

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Recent studies showed pointed out, that physical training can enhance cognitive abilities such as attention, spatial ability, memory performance, and executive functions (for reviews, see Hillman, Erickson, & Kramer, 2008; Mc Morris & Hale, 2012). However, most of these studies focused on the efficiency of cardiovascular training, whereas evidence for combined motor-cognitive training is scarce. Therefore, the aim of the present study was to investigate the effects of motor-cognitive coordination training and moderate cardiovascular training on cognitive functions and to test whether these effects varied as a function of physical fitness level. We tested 50 physically active (mean age=23.5 years, SD=3.2) and 56 sedentary participants (mean age=23.4 years, SD=3.2) in a pretest-training-posttest design with 12 sessions of moderate cardiovascular training ( $\approx 60\%$  HRmax) or motor-coordination training. The training groups were compared to a passive control group. At pretest and posttest, participants performed measures of cognitive flexibility, inhibition, working memory, spatial ability, and fluid intelligence. We found no transfer of training to cognitive measures in physically active participants. However, sedentary participants showed larger improvements in terms of inhibition in the coordination-training group than in the remaining groups, while the cardiovascular-training group improved more regarding cognitive flexibility than the remaining groups.

## **Tactile stimuli increase effects of modality compatibility in task switching**

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Modality compatibility refers to the similarity of stimulus modality and modality of response-related sensory consequences. Previous dual task studies found increased switch costs for modality incompatible tasks (auditory-manual/visual-vocal) compared to modality compatible tasks (auditory-vocal/visual-manual). The present task switching study examined modality compatibility and investigated vibrotactile stimulation as a novel alternative to visual stimulation. Interestingly, a stronger modality compatibility effect on switch costs was revealed for the group with tactile-auditory stimulation compared to the group involving visual-auditory stimulation. We suggest that the modality compatibility effect is based on cross-talk of central processing codes due to ideomotor “backward” linkages between the anticipated response effects and the stimuli indicating this response. This cross-talk arises only between tasks in task switching situations whereas single tasks performance remains unaffected. Due to a higher degree of compatibility in the tactile-manual tasks, crosstalk is increased in the tactile-auditory stimulus group compared to the visual-auditory stimulus group.

## **Movement, successive presentation and environmental structure and their influence on spatial memory in vista and environmental space**

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A vista space (VS), e.g., a room, is perceived from one vantage point, whereas an environmental space (ES), e.g., a building, is experienced successively during movement. Participants learned the same object layout during walking through multiple corridors (ES) or within a differently oriented room (VS). In four VS conditions they either learned a fully or a successively visible object layout, and either from a static position or by walking through the environment along a path, mirroring the translation in ES. Afterwards, participants pointed between object locations in different body orientations and reproduced the object layout. Pointing latency in ES increased with the number of corridors to the target and pointing performance was best along corridor-based orientations. In VS conditions latency did not increase with distance and pointing performance was best along room-based orientations which were oblique to corridor and walking orientations. Furthermore, ES learners arranged the layout in the order they experienced the objects, and less so VS learners. Most beneficial pointing orientations, distance and order effects suggest that spatial memory in ES is qualitatively different from spatial memory in VS and that differences in the visible environment rather than movement or successive presentation are responsible for that.

## **Whereabouts are you headed? – Structural aspects of landmark selection for route descriptions**

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Describing a known path to a nonlocal person is a viable but, nevertheless, non-trivial task. Beneath the range of objects located along the route, landmarks have to be selected, which we assume to be helpful for another person. Participants (N=24) learned a route in a virtual reality and, subsequently, wrote a route description either for the original travel direction or the return path. They were instructed to refer to one out of four objects at every intersection. When describing the initially learned travel direction, participants showed a preference for landmarks located in direction of turn (94.44%). Descriptions of the return path conveyed a significant increase of preference for the initial landmark position “before the intersection against the direction of turn”, which lies in direction of turn when anticipating the change in perspective for the return path. Results suggest that landmarks in direction of turn possess a unique structural character compared to landmarks at other locations, and that both, the initial and the anticipated reversed travel perspective, contribute to landmark selection when describing the return path. Hence, landmark selection does not just occur following a current perceived state of the environment and route, but is also modulated by situational task information.

## **Improved dual-task performance after practice due to efficient task instantiation**

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Practice of two simultaneous dual tasks results in an improvement of dual-task performance. With a priority on the second of the two tasks, the present study investigates the underlying cognitive mechanisms responsible for this improvement: The efficient instantiation of information of two component tasks in working memory at the beginning of each dual-task trial. This instantiation is the consequence of dual-task practice, but it is not the consequence of separate practice of two tasks in single tasks. While previous studies did not provide evidence for an efficient instantiation after dual-task practice with complex tasks, we analyzed dual-task performance with rather less complex tasks at the end of dual-task and single-task practice. Under conditions of these less complex tasks, we found advantageous dual-task performance after dual-task in contrast to single-task practice. These results are consistent with the assumption that improved dual-task performance after dual-task practice is the consequence of an efficient instantiation of information of two component tasks in working memory.

### **Are decisions more rational in a foreign language?**

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Recently it has been shown that participants make more rational decisions when problems are presented in a foreign compared to the native language, which has been explained by a greater emotional distance in the foreign language (Keysar, Hayakawa, & An, 2012; Costa, Foucart, Arnon, Aparici, & Apesteguia, 2014). In this study, we attempted to replicate this effect for German as the native and English as the foreign language in a series of three different framing problems. Additionally, we manipulated the wording of the problems to vary the emotional involvement. In one condition, the participants were addressed directly; in another condition the problems involved a third person. Interestingly, the framing effects were stronger (i.e. decisions were less rational) in the foreign than in the native language. The wording of the problems did not significantly influence decision-making. These results are at odds with previous findings. A possible explanation for this discrepancy is that German might be less emotional than other languages. Furthermore, participants' experience with the English language might have been extensive enough to form emotional associations in that language.

### **Parallel Exploration and Sketchmapping: A new approach for the visualization of spatial perception and learning processes**

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Simultaneous localization and mapping (SLAM) refers to a technique used by robots to build up a map of an unknown environment while at the same time keeping track of their current location. We investigated a similar approach for humans: participants were asked to produce a sketch map parallel to the exploration of an unknown virtual environment. We compared the properties of these sketch maps with sketch maps produced from memory by more traditional conditions (e.g., exploration with a topological map or without a map). Additionally, we tested the effects on spatial learning and memory. In the parallel sketch mapping condition, sketch maps of the environment were more complete and detailed as compared to the other conditions. Parallel Sketchmapping also resulted in better wayfinding performance and understanding of the spatial properties of the environment. We are currently extending our findings with a second study that also includes a different version of a parallel encoding task (i.e., concept-mapping, a method developed in instructional design). The presented approach may reveal new insights into the way humans intuitively structure an environment and which elements they consider important for future orientation.

## Can Reaction Time Measures Differentiate between Truthful and Deceptive Responses? – A Meta Analysis

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Evidence regarding the validity of reaction time (RT) measures of deception is mixed. The objective of this meta-analysis was to investigate whether RTs can differentiate between truthful and deceptive responses within participants, and to identify moderators of the RT deception effect. Results of 85 independent studies revealed a large average effect size, even after correction for publication bias (standardized paired difference:  $d = 0.902$ ; 95% CI [0.767; 1.036]). They also revealed a large heterogeneity between studies ( $I^2 = 83\%$ ). The average effect tended to be higher in studies in which RTs were reported as primary measure, and decreased with  $d = 0.059$  per (later) publication year in this subgroup. Also, the average effect was smaller, yet still large, in studies in which participants were not instructed to respond as fast as possible, and when participants received motivational instructions to deceive successfully. Other moderator effects (type of paradigm, stimulus salience, absolute number of trials, and proportion of truth/lie trials) were not significant. The large effect size observed across all included laboratory studies indicates that it is worthwhile to further explore the potential to detect deception through RTs. Future research should investigate the cognitive mechanisms underlying RT deception effects, their external validity in samples from different populations, and their vulnerability to countermeasures.

## Do dogs stick to what they have learned or do they follow the crowd?

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While several studies have shown that dogs' performance can be enhanced by the observation of conspecifics (social learning), so far no study has tested whether dogs display conformity, that is, follow an incorrect majority. To fill this void, we adapted the classic Asch paradigm to examine conformity in dogs. In all experimental conditions, dogs could walk past a wall on the left or the right side. In the first phase, each dog (called the observer dog) learned that one direction was associated with a reward. In the three demonstrator condition, the observer dog then watched three other dogs that one after another walked past the wall in the direction contrary to the one the observer dog had learned. In the one demonstrator condition, the observer dog watched one other dog that three times in a row walked past the wall in the direction contrary to the one the observer dog had learned. By contrast, in the control condition, there were no demonstrator dogs. In the test phase, we examined whether the observer dogs stuck to what they had learned. The results revealed that there were no significant differences between the three experimental conditions. Thus, dogs did not show conformity.

## Direct haptic feedback benefits control performance during steering

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Haptic feedback can be introduced in control devices to improve steering performance, such as in driving and flying scenarios. For example, direct haptic feedback (DHF) can be employed to guide the operator towards an

optimal trajectory. It remains unclear how DHF magnitude could interact with user performance. A weak DHF might not be perceptible to the user, while a large DHF could result in overreliance. To assess the influence of DHF, five naive participants performed a compensatory tracking task across different DHF magnitudes. During the task, participants were seated in front of an artificial horizon display and were asked to compensate for externally induced disturbances in the roll dimension by manipulating a control joystick. Our results indicate that haptic feedback benefits steering performance across all tested DHF levels. This benefit increases linearly with increasing DHF magnitude. Interestingly, shared control performance was always inferior to the same DHF system without human input. This could be due to involuntary resistance that results from the arm-dynamics.

### **Keeping up at the Horse Race: Neural Mechanisms Underlying Parallel Programming of Automatic and Volitional Saccades**

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The antisaccade task is a prominent tool to investigate the response inhibition component of cognitive control. Recent theoretical accounts explain performance in terms of parallel programming of exogenous and endogenous saccades, linked to the horse race metaphor. Previous studies selectively slowed endogenous or exogenous programming processes by manipulating the antisaccade probability in an experimental block. However, neural mechanisms of parallel saccade programming remain not fully understood. We analyzed task-related eye movements and blood oxygenation level dependent (BOLD) responses using fMRI obtained from healthy participants in a mixed antisaccade and prosaccade task. Antisaccade latencies and error rates increased under conditions of infrequent antisaccades, indicating successful deceleration of antisaccade programming. The opposite pattern was observed for prosaccade latencies and error rates. The BOLD signal significantly increased in cortical areas of the saccade network during infrequent eye movements, i.e. the left frontal eye field (FEF) and left pre-supplementary motor area (pre-SMA) during prosaccades and the bilateral FEF and particularly bilateral intraparietal sulcus (IPS) during antisaccades. In conclusion, the fronto-parietal network, especially the IPS, plays a key role in compensating additional preparation costs when antisaccade programming is systematically slowed. These areas facilitate successful cognitive control when directionally incompatible oculomotor responses strongly compete for execution.

### **Top-down and bottom-up predictability effects in speech perception**

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The rapid computation of phonemic sequences in real time is essential in speech perception and word recognition. We recently found that the human brain uses the probabilistic structure of speech phonotactics to reserve perceptual access to expected phonemes, filtering out unexpected candidates. German native speakers listened to continuous streams of meaningless pseudowords, organised in oddball sequences based on phonotactic status – frequent legal/rare illegal, frequent illegal/rare legal –, in the absence of any physical regularity (e.g., stimulus repetition). A prediction error response emerged in the EEG for legal but not for illegal stimuli, demonstrating that top-down speech predictions apply pre-perceptually. We also found that spectral matching to previous context facilitates predictability extraction in noise. Participants listened to sequences of even standard and odd deviant pairs, the latter being either full spectrum vowel deviants (FD), 4-band vocoded vowel deviants (VD), or 4-band vocoded standards (VS). We evidenced a larger prediction error suppression for

predictable deviant repetitions in FD and VS conditions. A similar pattern was detected for the responses to rare omissions of the repeated deviants, suggesting that partial spectral matching to a standard pair enhanced VS processing. Top-down and bottom-up predictions concurrently facilitate real-time speech perception.

### **Directed forgetting in motor learning**

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Directed forgetting comprises costs and benefits. Whereas the intention to forget a just learned item list usually impairs later recall correspondingly to this intention, recall of subsequently encoded material profits. Reduced proactive interference, a shift of internal context, and different encoding strategies are assumed to cause this effect. We investigated list-method directed forgetting of motor sequences. Participants learned two sets of sequential finger movements. The instruction to forget the first set resulted in a benefit for the subsequently learned set in a series of experiments. Participants receiving the instruction to forget the first set of motor sequences recalled significantly more sequences of the second set than participants not receiving this instruction. However, a cost effect for the first set of sequences emerged only when participants were able to shift their internal context after receiving a forgetting instruction. These findings show that the intention to forget enhanced subsequent motor learning, independently of access to previously learned motor sequences.

### **How personality influences fair behavior – an experimental test of benevolence versus a (blind) fairness norm**

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A variety of cooperative, fair, and pro-social behaviors are at the heart of human interactions. Research consistently hints that the personality trait “Honesty-Humility” represents a vital determinant of such behaviors. However, this link is insufficiently understood and different motivational mechanisms can be hypothesized. To close this gap, we test two of these potential mechanisms: benevolence versus an internalized (blind) fairness norm. In a fairness paradigm, we implemented an unfair situation through asymmetrical rewards for performance in a quiz. Depending on the experimental condition, the reward asymmetry was either to the participants’ advantage or disadvantage. Finally, participants were empowered to redistribute all rewards at will between themselves and their hypothetical counterpart. In line with the benevolence account, individuals high in Honesty-Humility established a fair distribution if they themselves were advantaged (thus ensuring they do not exploit others). By contrast, if they were disadvantaged, they refrained from rectifying the asymmetry (by taking points from the other). In sum, this pattern cannot be accommodated by a (blind) fairness norm – which would have implied that individuals high in Honesty-Humility establish an equal distribution irrespective of who is advantaged – but provides first evidence for benevolence as the driving force underlying individuals’ fairness.

**Does depression alter the internal clock?  
A meta-analysis on time perception in depressive patients**

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Depressive patients frequently report to perceive time as going by very slowly. Potential effects of depression on duration judgments (interval timing) have been investigated mostly by means of four classical time perception tasks: verbal time estimation, time production, time reproduction, and duration discrimination. Ratings of the subjective flow of time have also been obtained. In a meta-analysis, we analyzed the results from 16 previous studies investigating effects of depression on time perception in a control-group design, representing data of 433 depressive patients and 485 healthy control subjects. For each task, the effect sizes (Hedge's  $g$ ) were analyzed with a random-effects meta-regression model, where the duration of the judged time intervals ( $< 1s$ ,  $1s - 10s$ ,  $10s - 10min$ ,  $>10min$ ) was entered as a covariate. The analyses showed that depressive patients judge the flow of time as being less quickly than control subjects do ( $g = 0.66$ ,  $p = .033$ ). However, in none of the interval timing tasks did depression have a significant effect, the effect sizes ranged between 0.04 and 0.38. There was also no significant effect of interval duration, although for time production there was a tendency towards overproduction of short and underproduction of long durations in depressive patients.

**Subjective perceptual reports of foreground-background formation in complex auditory scenes**

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In everyday life, we continuously decompose our auditory environment in order to identify available sound sources and to select the relevant source, such as a conversation partner, as perceptual foreground. This decomposition process, called auditory scene analysis, rests on the integration and segregation of sounds arising from the same or different sources. Empirical research on auditory scene analysis primarily relies on interleaved mixtures of only two sound sequences, which heavily limits the number of perceptual organizations. To overcome this limitation, we presented mixtures of three sound sequences that varied in frequency and spatial separation. Participants listened to these sequences and reported their subjective perception by continuously choosing one out of 12 perceptual organization alternatives. As expected, the perception of the multi-stream sequences switched back and forth between the various perceptual alternatives (multistability). Likewise in line with the hypotheses, spatial as well as frequency separation raised the proportion of stream segregation and reduced the proportion of integrated percepts. Yet in contrast to the hypotheses, many participants had a tendency to perceive two equally salient streams in the foreground, rather than reporting percepts with a clear foreground-background distinction. The implications of these results for models of auditory scene analysis will be discussed.

## **Generation and the subjective feeling of „aha!“: Independent contributions to learning from insight**

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It has been proposed that sudden insight into the solution of a problem can enhance long-term memory for the same. However, what exactly an insight is has been operationalized differently across studies. Here, we discuss two main aspects of insight problem-solving—the generation of a solution and the subjective "aha!" experience—and experimentally evaluate their respective contributions to long-term memory encoding. Our results suggest independent contributions of generation (generated solution vs. presented solution) and the "aha!" experience (aha, no aha) to learning from insight as well as to the emotional response towards understanding the solution. Moreover, we analyzed the relationship between generation and the "aha!" experience and two different measures of memory: incidental, automatic retrieval processes and intentional, voluntary retrieval. Here we found that the generation effect was larger for incidental memory performance, while the effect of the “aha!” experience was larger for voluntary conscious retrieval. All in all, our results stress the importance of both aspects of insight in learning and that both generation and insight should always be taken into account when investigating the effect of insight on learning.

## **Visuelle Suche bei App-Icons mit Ähnlichkeitsmanipulation**

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Bei visuellen Suchaufgaben wird die Aufmerksamkeitssteuerung durch verschiedene Aspekte wie Farbe, Bewegung oder Ausrichtung beeinflusst (Wolfe & Horowitz 2004), wobei insbesondere die Ähnlichkeit zwischen Zielreiz und Distraktoren eine wichtige Rolle spielt (Duncan & Humphreys, 1989). Ziel dieser Arbeit war die Entwicklung eines Sets an realitätsnahen und komplexen App-Icons, bei dem Ähnlichkeit gezielt über Farbe manipuliert werden kann, sowie die Validierung dieser Manipulation. Anhand einer studentischen Stichprobe (n=18) wurden 520 Icons (26 Motive in jeweils 20 Farben) in einer visuellen Suchaufgabe mit Reaktionszeit als abhängiger Variable auf einem 10 Zoll-Touchgerät untersucht. Dabei wurden die Faktoren Anzahl der Icons, Anwesenheit des Zielreizes, Ähnlichkeit zwischen Distraktoren und Ähnlichkeit zwischen Zielreiz und Distraktoren variiert (3x2x2x2). Ähnlichkeit wurde über die Zuordnung der 20 Farben zu vier Farbgruppen definiert. Die Ergebnisse zeigten signifikante Haupteffekte aller vier Faktoren sowie hohe Signifikanzen aller Interaktionen. Das im Bezug auf die Ähnlichkeit validierte Iconset kann für weiterführende Studien genutzt werden wie zum Beispiel bei der Suche nach kognitiv-ergonomischen Optimierungsmöglichkeiten für die Anordnung von App-Icons auf Touchgeräten. Darüber hinaus deuten die Ergebnissen darauf hin, dass die Aufmerksamkeitssteuerung mit Hilfe von starker Farbgebung auch bei sehr komplexen Stimuli gezielt beeinflusst werden kann.

## Early influence of social conformity on visual processing in group pressure situations investigated by EEG

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In previous psychological experiments, participants adapted to erroneous group opinions in a visual perception task, which they could easily solve correctly when performing on their own. In our first EEG study, we asked whether this phenomenon of social conformity influences early stages of visual perception or later stages of conscious decision-making in a visual discrimination task. We showed that social conformity to the wrong group opinion resulted in a decrease of the posterior-lateral P1 in line with a decrease of the later centro-parietal P3. Our results suggest that group pressure situations might impact early unconscious visual perceptual processing, which results in a later diminished stimulus discrimination and an adaptation even to the wrong group opinion. In a follow-up EEG study, we applied the same paradigm in participants with high(HA) and low(LA) levels of autonomy. LA-participants adapted to the incorrect group opinion significantly more often than HA-participants, which was also reflected in a decreased P1 component. In conclusion, first, our ERP data suggest that the group context can have early effects on our perception in LA-, but not HA-participants. Second, we replicated results of our first study showing an impact of social group pressure on early visual perception in LA-participants.

## Exploring the Uncanny-Valley-Effect in Affective Human-Robot Interaction: The Impact of Emotion Expressions on the Perception of the Robots' Design

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The socio-emotional interaction with robots might become an important part of our future. To ensure a smooth and viable human-robot interaction, crucial design and appearance features of robots need to be considered. Our current experimental study investigates how different types of robots are perceived in complex affective settings in order to examine the importance of salient robot design aspects with regard to authentic affective human-robot interaction. To ensure credibility and to capture the complexity, we used 16 different scenes from robot movies, in which robots were shown that systematically differed in their anthropomorphic appearance and behavior. Participants (N=97) rated the human-likeness and perceived uncanniness over four types of robots and each type in four different 'emotional states' (happiness, sadness, anger vs. neutral). Results showed that the selected movie scenes were suitable to clarify the predicted uncanny-valley-effect and revealed significant effects of the displayed emotions on humans' perception of the robots' design. The uncanniness ratings might help to classify and understand this effect for an improved robot design in terms of a more human-centered human-robot interaction. Furthermore, subjects with a higher technical affinity rated robots more uncannily in general. These findings raise further issues for psychological research in social robotics.

## The independence of orientation and luminance information in the oculomotor system

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The aim of this project was to investigate how the oculomotor system integrates different dimensions of salience for saccade trajectory planning. Salient contrasts of orientation (van Zoest et al., *J Vis*, 2012) and of luminance (Jonikaitis & Belopolsky, *J Neurosci*, 2014) cause deviations in the trajectories of fast reactive saccades. We posed the question of how these two dimensions of salience are integrated for eye movements, specifically whether they interact or are combined additively. 18 participants each completed 800 trials of a saccade task with an invariant target and a distractor of varying salience. Crucially, the luminance and orientation contrast of the distractor were varied orthogonally, permitting us to measure the effect of the same increase in luminance at different levels of orientation contrast. Increases in saccade deviations towards the distractor were the same for the same increase in luminance regardless of the level of orientation contrast, and conformed closely to the predictions of an additive model, even when compared with interactive effects much weaker than those observed for subjective judgements of salience (Nothdurft, *Vis Res*, 2000). These results suggest that orientation and luminance contrasts provide mostly independent information to the oculomotor system, and contribute additively to oculomotor salience maps.

## Prior Entry: Model-based Analysis of Temporal Order Judgments

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Prior entry, the faster perception of attended stimulus, has been studied for more than one and a half century. In the last few decades, however, psychometric analysis of temporal order judgment data has mainly been a practice of data-fitting, which, regrettably, is model-free with respect to the underlying cognitive processes. The sigmoid functions fitted to the data allow stable estimates of the summary parameters discrimination accuracy and point of subjective simultaneity. With regard to the cognitive processes leading to the percepts, however, they provide little insight. To address this problem, we derived a psychometric function for temporal order judgments from Bundesen's Theory of Visual Attention (TVA). When fitted to data, parameters can be estimated that---backed up by TVA---describe processing speeds and perceptual latencies. This is an important improvement over the traditional methods. For example, the new method can be used to assess whether the attended stimulus is accelerated or if the unattended is slowed down. Furthermore, explicit mechanisms that produce the central plateaus commonly found in temporal order judgment data can modeled. Here we present our recent advances with model-based investigations of these questions.

## **„Feeling smart“ – A refreshing talk on how caffeine really enhances your brain**

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Many studies have shown that caffeine can enhance cognitive functions. However, a closer examination reveals that cognitive enhancement by caffeine is mostly found in tests that benefit from higher vigilance, such as reaction time tasks or motor-skill performance. But what does that mean for our everyday lives? Does a cup of coffee before entering an exam improve its outcome? To find out, we ran a balanced within-subjects study with two types of treatment conditions: caffeine and placebo, both served as beverages. After the drink consumption, subjects had to undergo an extensive test battery including logical thinking, memory, and sustained attention tasks – lasting about 2 hours to resemble a real-life exam. Before and after the testing session, subjects filled in a questionnaire about their current affective states. We found that caffeine is not capable of significantly enhancing higher cognitive functioning. However, the mood ratings revealed that subjects, who consumed a caffeinated drink, felt significantly more energetic and judged their own performance as better as compared to subjects in the placebo group. After two further control studies we can exclude potential placebo effects, and even a 24 h caffeine withdrawal before the testing largely confirmed our findings.

## **Perceptual Fluency Contributes to Size Effects on Judgments of Learning**

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Judgments of learning (JOLs), that is, people's predictions about the likelihood of recalling recently studied items on a test, are higher for words presented in a larger font (48 pt) than for words presented in a smaller font (18 pt), even though font size does not influence memory performance. Recently, it has been shown that this effect relies on people's beliefs about memory rather than on perceptual fluency. In three experiments, we investigated whether perceptual fluency contributes to size effects on JOLs if (a) stimuli vary substantially in perceptual fluency and (b) size differences are subtle. People were presented with pictures of common objects (Experiment 1), pictures of faces (Experiment 2), and words (Experiment 3). Each stimulus was initially so small as to be entirely unrecognizable and gradually increased in size. Across trials, the speed of the clarification process was manipulated. JOLs were higher for stimuli that clarified fast than for stimuli that clarified slowly. Importantly, this effect did not result from a direct effect of clarification speed on JOLs, but from an indirect effect of clarification speed on JOLs mediated by the speed with which stimuli were identified. This suggests that perceptual fluency may cause size effects on JOLs.

## Development of School Nurse Work Motivation Scale in Japan

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This study was aimed to investigate work motivation of school nurses. We executed a new scale to measure work motivation based on Self-Determination Theory. The participants were 346 school nurses who worked at elementary school, junior high school, senior high school and private junior and senior high school. Their average years of experience were 18.67 years (SD=11.55). 24 items were extracted as preliminary version through pilot interviews. Using these items, we administered a questionnaire and performed a factor analysis. As a result of factor analysis, the scale was consisted of following 4 factors (18 items). And 4 factor's name were as follows: "Worthwhile of Job", "Cooperation with Colleagues", "High Expertise" and "Defend One's Position". The validity of the new scale was confirmed by comparing each factor to the results of previous study. The reliability of the new scale was examined for  $\alpha$  coefficients. Cluster analysis of each sub-scale was performed to investigate individual differences. As a result, subjects were classified into 4 groups. The new scale in this study enabled us to measure work motivation of school nurses and its individual differences. And this study might be useful for further study related to accomplishment and adaptation of school nurse work.

### **Does the help seeker's status differently affect the kind of provided help in different cultures?**

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Previous research on helping behavior has shown that the intention to help is affected by a multitude of factors (e.g., the perceived dangers of the situation at hand, the cost-benefit ratios of action and passiveness, the number of present bystanders, and attributions of responsibility). However, more recent research demonstrated that it is not sufficient to put the focus only on the binary decision to provide help, or not. Nadler and Chernyak-Hai (2014) highlighted the importance of the kind of provided help. Based on their findings, that people offer different kinds of help (dependency-oriented vs. autonomy-oriented) in dependence of the help seeker's status, we raised the question whether this phenomenon could also be observed in different cultures (i.e., individualistic vs. collectivistic). The results of a series of quasi-experimental studies showed that the help seeker's status does affect the kind of provided help in individualistic cultures, but not in collectivist cultures. Theoretical and practical implications of these findings will be discussed.

## **Numerosity as a visual dimension: Insights from peripheral viewing**

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It is currently debated whether numerosity is a basic visual perceptual dimension. We investigated whether, like for other visual dimensions, peripheral viewing alters perceived numerosity and whether this effect is secondary to other low-level perceptual biases. We found the numerosity of a peripherally presented array of dots to be largely underestimated compared to central viewing, particularly when the elements were tightly clustered. We then showed that the differential contrast sensitivity as a function of spatial frequency in peripheral viewing cannot explain the reduction of perceived numerosity. This required de-composing the dot arrays into different spatial frequency sub-bands, testing sensitivity for each sub-band and re-composing the scaled sub-components to obtain equal effective contrast in the center and in the periphery. Even after sub-band sensitivity equalization, peripheral perceived numerosity was reduced. We also excluded a possible distortion of the perceived size of the dot array as a cause of the effect. Having excluded these potential causes, we suggest that visual crowding might explain why some of the elements viewed in the periphery are not available for numerosity perception. This would imply that numerosity is not simply part of texture processing. It indeed seems to form a basic visual dimension by itself.

## **Asymmetrical oculomotor capture by motion and color singletons in dynamical visual search displays**

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Using eye tracking we investigated how local motion deviations influence oculomotor control. We used dot kinematograms as targets and distractors and manipulated set size by showing the dot pattern through a variable number of apertures. Our experiment comprised three conditions: (1) search for motion or color singletons with no irrelevant singletons, (2) search for motion singletons with irrelevant color singletons, (3) search for color singletons with irrelevant motion singletons. In each trial participants fixated the screen center while the dots in all apertures showed the same globally coherent color and motion direction. After a short interval, the motion direction or the color of the dots switched at one aperture while the other feature switched at another aperture. Participants' task was to make a saccade to the aperture with the target and ignore the irrelevant singleton. We analyzed error rates, saccadic reaction times and trajectories. Results showed strong oculomotor capture by irrelevant color singletons while capture was much weaker with irrelevant motion singletons. Moreover, set size affected search performance differentially depending on the target and distractor dimensions. We conclude with relating our findings to the previous literature and outline further planned experiments.

## **Social Mindfulness, Trust, and Human Cooperation**

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The interdisciplinary and broad theme of trust and human cooperation often assumes that cooperation always needs to be costly, and that people always “see” the cooperative option. We suggest that both assertions often are not true, and that people can build trust and realize cooperation through social mindfulness: prosocial behavior that is not costly but does require a social mind to see the cooperative option. Social mindfulness is conceptualized as making other-regarding choices that involve both the ability and the motivation to act mindfully toward other people’s control over their situational outcomes. We report a series of initial studies showing that social mindfulness enhances trust, and that social mindfulness is greater with friends than strangers, and greater with others with trustworthy faces versus untrustworthy faces. We also provide some evidence that sometimes it takes a social mind to engage in mindful rivalry, the motivation to frustrate another person’s goals by deliberately limiting another person’s options. In particular, mindful rivalry exists when faced with people we hate, as well as with people that are members of rival outgroups, as demonstrated in professional soccer players. These findings will be illustrated by recent behavioral and neuroscientific evidence.

## **Reproducibility Project: Design**

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Volunteer researchers selected a study to replicate from a quasi-random sample of studies published in three prominent journals from the 2008 publication year. Several strategies were followed to maximize the quality – and hence diagnosticity -- of replication attempts. Each replication used sample sizes that achieved at least 80% power to detect an effect as large as the effect reported in the original article. Most studies achieved power levels of 90% or higher. Replication teams contacted original authors to acquire original materials and any missing methodological details required for a fair replication attempt. In addition, each team drafted a replication protocol outlining the procedure and data-analysis plan. The protocol followed a standard template and was sent to original authors for review. Any design discrepancies identified by the original authors were addressed or documented. Prior to data collection, the final replication protocol was registered and added to an online repository.

## Does sleep transform intuition into insight?

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In recent years, vibrant research has developed on "consolidation" during sleep: To what extent are new experiences reprocessed or even restructured during sleep? We have used the number reduction task (NRT) and the serial response time task (SRTT) to study if and how sleep may lead to new insights, based on non-conscious intuitions implicitly learned before sleep. In the NRT, regularities may become explicitly conscious at some point, leading to a qualitative change in behavior which reflects this insight. A night of sleep between two NRT sessions tripled the number of participants attaining insight. Participants who had acquired implicit intuition before sleep (reflected in specific speeding of responses predictable by the covert regularity) and gained insight after sleep had increased EEG during slow-wave sleep of the intervening night in the slow-spindle 10–12 Hz band. These sleep-EEG results were replicated with the SRTT. However, these participants' increased 10–12 Hz spindle activity occurred already in the lab-adaptation night preceding the first session, before any task. So this activity does not reflect a task-specific restructuring process but rather is specific to participants who were later able to convert their implicitly acquired knowledge to explicit insight.

## Organic by default? On the relationship between defaults and attitudes

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Research aim: Defaults are frequently discussed as subtle means to change the choice architecture in order to influence individual decision making and behavior. Several studies in the field and lab demonstrate default effects. However, attitudes as another driving force of behavior have largely been ignored. We examine the interplay of attitudes and defaults to test the hypothesis that both additively produce behavior change. Defaulting, i.e. sticking to a default, is assumed to result from an interaction of default and attitude. Method: In an online shopping simulation study 242 participants from a German online panel decided on five different products each. They were presented with either an organic default product or a conventional default product (between condition) but could choose among different alternative products from an online shop. Environmental attitude was measured for every participant. Results: As predicted, default condition and environmental attitude both significantly and independently predicted the amount of organic products chosen ( $R^2 = .34$ ). The probability to default was significantly predicted by the default by attitude interaction ( $R^2 = .10$ ) such that the attitude-congruent defaults lead to more defaulting than attitude incongruent defaults.

### **The neural representation of visual and auditory numbers — An fMRI adaptation study**

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A large body of evidence indicates that the intraparietal sulcus (IPS) is a central brain region for representing the semantic content of numbers (i.e., numerical magnitudes). However, little is currently known about differences and commonalities in the way the human brain represents visual (i.e., Arabic digits) and auditory numbers (i.e., number words). The present work aimed to unravel the neural correlates associated with the representation of visual and auditory numbers. Using functional Magnetic Resonance Imaging adaptation, the brain activity of 34 adults was measured. For this, one digit/number word was repeatedly presented on a computer screen/headphone and randomly interspersed with the presentation of new digits/number words (deviants). We investigated the neural signal recovery in response to the deviants. A whole-brain analysis revealed numerical ratio dependent signal recovery in the left IPS across both modalities. On the other hand, representational similarity analysis of the left IPS demonstrated modality specific differences in the underlying, voxel-wise activation pattern. Together, the results of the present work suggest similar brain engagement in the left IPS for the processing of visual and auditory numbers. Though the IPS processes both auditory and visual numbers, the underlying, distributed representations therein appear to be different.

### **Are cognitive variables associated with children's prosocial behavior?**

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Prosociality, being essential for building and maintaining relationships with other people, can be studied by using economic games, which shed light on how people share resources with one or more partners and how they react to unfairness displayed by others. The Ultimatum Game (UG) allows one player to share resources with a partner who can accept or decline the offer. The Public Goods Game (PGG) is played by groups of people who can choose if and how much to invest into a public good which is divided equally between all players. Studies with preschoolers using these games are rare. Even less is known about the relationships between prosocial behavior and cognitive variables. Studies with adults suggest that such relationships exist, but it is yet unknown whether this is also true for children. We conducted two studies with preschoolers to investigate whether there is a relationship between their acceptance of different offers in an UG and their behavior in a PGG on the one hand and general intelligence, mathematical abilities, Theory of Mind, and the ability to delay gratification on the other hand. The results were not as straight forward as expected. Nevertheless, some interesting findings emerged that require further investigation.

## **Brain networks supporting visual perceptual grouping**

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Local elements are grouped into global objects seemingly without effort by the human visual system. Using a contour integration task and EEG source level analyses, we tested the hypothesis that visual perceptual grouping requires a top-down selection, rather than a passive pooling, of neural information that codes local elements in an image. The participants were presented visual displays with or without a hidden contour. Two tasks were performed: a central luminance-change detection task and a peripheral contour detection task. Only in the contour-detection task could we find differential brain activity between contour and non-contour conditions, within a distributed brain network including parietal, lateral occipital and primary visual areas. Contour processing was associated with an inflow of information from lateral occipital into primary visual regions, as revealed from the slope of phase differences between source level oscillations within these areas. The findings suggest that contour integration results from a selection of neural information from lower visual areas, and that this selection is driven by the lateral occipital cortex.

## **Same or different? A synopsis.**

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This presentation has two purposes: First, I will summarize the different presentations and positions on intuition and insight as they were defined in the two sessions on the topic. Particularly, similarities and differences concerning the underlying cognitive processes will be the focus. Second, I will suggest that intuition differs from insight concerning the (introspective) access to unconscious processing. Whereas decision makers intuit the solution to a problem, people solving the problem by insight show to lack such hunches. Thus, insightful solutions as in contrast to intuitive ones seem to be discrete phenomena in terms of availability to awareness.

## Diagnosticity and Utility of Response Latency in Delayed Judgments-of-Learning

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Research. Metcalfe and colleagues have recently suggested a two-stage process underlying delayed-JOLs, using response latency as an indicator. According to this model, people make delayed-JOLs in a cued-recall test based on retrieval attempts (second stage/slow latencies) only if they have previously recognised the cue (first stage/fast latencies). Method. 42 older adults (Mage = 67 years  $\pm$  5.8) studied 30 paired associates and were randomly assigned to two groups: 21 made JOLs without special instructions ("JOL only") and 21 were instructed to first retrieve the target and then made JOLs ("JOL-with-pre-JOL-recall"). The response latencies of the JOL-ratings were recorded as an indicator of recognition (fast latencies) or retrieval processes (slow latencies). Results. Mean percentages recalled in the "JOL only" and "JOL-with-pre-JOL-recall" groups were 47% and 50%, mean relative accuracy  $\gamma = .70$  and  $\gamma = .77$ , respectively. There was no significant effect of condition neither on final performance ( $t(40) = -.99$ ,  $CL(95\%) = -.21-.07$ ,  $\eta^2 = .023$ ) nor on relative accuracy ( $t(40) = -.44$ ,  $CL(95\%) = -.18.5-11.8$ ,  $\eta^2 = .004$ ). The functions of the JOL latencies were monotonic, showing an increase in response latencies with decreasing JOL, and parallel between the two groups, as would be expected if only retrieval fluency entirely determined JOLs. The present study thus supports the retrievability-hypothesis in delayed-JOLs.

## Light ceilings don't just seem higher, they look it

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Previous studies reported the perceived height of interior spaces to increase with increasing ceiling lightness. These experiments used verbal estimates of ceiling height, e. g., in centimeters, which might be influenced by cognitive processes. In the present study, we used a height matching task based on comparisons of a given interior space to a pillar. The pillar was presented on the interior space's floor without surrounding walls or ceiling. These direct height comparisons should reflect perceptual rather than cognitive judgments. In a two-interval task, participants compared the ceiling height of rectangular interior spaces to the height of a pillar in a virtual reality setting. Ceiling lightness, physical ceiling height, and the distance between observer and pillar were varied in a repeated-measures design. For each combination of these parameters, the pillar height was varied, and the point of subjective equality (PSE) and the difference limen (DL) were estimated from the psychometric function. We found an effect of ceiling lightness on the height matches, in the same direction as in the earlier studies. This result is compatible with our assumption that the effects of ceiling lightness can be attributed to early stages of visual perception rather than to cognitive effects.

## **Neural Substrates of Similarity and Rule-based Strategies in Judgment**

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In categorization, it has been demonstrated that similarity-based and rule-based strategies are associated with activity in different brain regions. Building on this research, the present work tests whether solving two identical judgment problems recruits different neural substrates depending on people's judgment strategies. Combining cognitive modeling of judgment strategies at the behavioral level with functional magnetic resonance imaging (fMRI), we compare brain activity when using two archetypal judgment strategies: a similarity-based exemplar strategy and a rule-based heuristic strategy. Using an exemplar-based strategy should recruit areas involved in long-term memory processes to a larger extent than a heuristic strategy. In contrast, using a heuristic strategy should recruit areas involved in the application of rules to a larger extent than an exemplar-based strategy. Largely consistent with our hypotheses, we found that using an exemplar-based strategy led to relatively higher BOLD activity in the anterior prefrontal and inferior parietal cortex, presumably related to retrieval and selective attention processes. In contrast, using a heuristic strategy led to relatively higher activity in areas in the dorsolateral prefrontal and the temporal-parietal cortex associated with cognitive control and information integration. Thus, even when people solve identical judgment problems, different neural substrates can be recruited depending on the judgment strategy involved.

## **Diffusion Model Analyses for Slow Decisions**

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With a diffusion-model analysis, cognitive components underlying binary decisions can be mapped onto different parameters that are estimated from response time distributions. Specifically, the model provides (1) estimates for the speed of information processing, (2) response thresholds for the two different responses, and (3) the duration of non-decisional processes. This separation of different cognitive components of binary judgments makes the model a powerful tool to test psychological hypotheses. Typically, diffusion models are applied to data from cognitive paradigms that comprise several hundred (or thousand) trials of a task with fast response latencies (e.g., RT < 1000 ms). In the present project, we explore whether it is possible to apply the diffusion model to tasks with notably longer latencies (e.g., RT = 10 seconds). Different tasks have been adopted for this purpose, in which multiple sources of information have to be integrated to an overall judgment. Model performance is assessed by an empirical validation of parameters and by the assessment of model fit.

## **Driver strategies in the context of multiple tasks: An inverse approach**

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It is well known that cognitive resources are limited and humans therefore can work only on a certain amount of tasks simultaneously. Due to the resulting risk potential this is especially problematic while driving. Thus, simultaneously conducted activities like texting hold the risk of impairing the performance in the main task driving. However, drivers are engaged in non-driving related activities in more than 50% of the driving-time. Most interestingly, severe accidents happen to occur only in a comparably small number of cases. The present study tackles this issue and hypothesizes drivers to use strategies to successfully manage critical driving scenarios. To examine these strategies we carried out an empirical study with drivers performing simulated driving and non-driving related tasks in parallel. In advance, participants rated driving scenarios with varying driving performances in order to define a range of accepted deviations from an optimal driving performance. Results revealed a subjective cut-off above which driving performances are perceived as inappropriate. Furthermore, drivers were observed to degrade (re-enhance) their secondary task activity when their driving performance exceeds (re-enters) the defined subjective cut-off. In other words, we assume driver strategies to support drivers in setting priorities with respect to current tasks in demanding situations.

## **Self-Regulating Rejection Sensitivity by Mental Contrasting**

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In two studies we tested if the self-regulation strategy of mental contrasting (vs. indulging) can change the habitual responses of people with low and high rejection sensitivity. Mental contrasting is a self-regulation strategy, in which a positive future is juxtaposed with an obstacle in the present reality that stands in the way of reaching the positive future (Oettingen, 2012). Indulging is a self-regulation strategy, in which only the positive future is imagined. We hypothesize that mental contrasting (vs. indulging) sensitizes people with low rejection sensitivity and desensitizes people with high rejection sensitivity. In both studies we first measure rejection sensitivity. After that participants mentally contrast or indulge about an idiosyncratic interpersonal wish. Then we present participants with a hypothetical ambiguous rejection of their wish. Our dependent variables are emotional and behavioral reactions (Study 1) and perception of rejection (Study 2). The results show that for participants in the indulging condition the perception of and reaction to rejection is predicted by their rejection sensitivity score, but for participants in the mental contrasting condition it is not. Thus mental contrasting balances the rejection sensitivity disposition by making people with low rejection sensitivity more sensitive and people with high rejection sensitivity less sensitive.

**(Gem)Einsam: Der Einfluss von sozialer Interaktion  
auf das Nutzungserleben und die Motivation älterer Menschen.**

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Der Austausch mit anderen Menschen ist eine wichtige Ressource, um insbesondere im höheren Erwachsenenalter (60 bis 80 Jahren) aktiv zu bleiben und an Lebenszufriedenheit zu gewinnen. Das Erleben von Verbundenheit bietet hierbei nicht nur eine Basis für selbstbestimmtes Handeln (Deci & Ryan, 2000), sondern stellt auch eine Möglichkeit dar, positive Benutzererlebnisse mit Technik zu vermitteln (Jordan, 2000). Diese positive User Experience (UX) wiederum könnte helfen, Senioren spielerisch an moderne Technologien heranzuführen, ihren Zugang zu Technik spürbar zu erleichtern und eine Nutzung längerfristig zu motivieren. Im Rahmen eines laborexperimentellen Versuchsdesigns wurde der Einfluss von Verbundenheit auf das Erleben interaktiver Technik systematisch an einer Stichprobe von 36 Personen im Alter von 60 bis 80 Jahren untersucht. Als unabhängige Variable kamen drei unterschiedliche Grade an sozialem Austausch während Nutzung eines interaktiven Spiels zum Einsatz: 1) ohne Austausch, 2) mit Vergleich der eigenen Leistung zur Leistung einer der Versuchsperson jeweils bekannten zweiten Person und 3) mit Leistungsvergleich und Möglichkeit zur direkten Video-/ Audiokommunikation. Als abhängige Variablen wurden vor allem subjektive Maße zur Motivation, Emotion und Wahrnehmung des interaktiven Systems erhoben. Erwartete Einflüsse durch Persönlichkeitseigenschaften und die individuelle Affinität zu Spielen wurden durch entsprechende Kontrollvariablen berücksichtigt. Die Ergebnisse werden in Bezug zu vorliegenden Befunden diskutiert.

**Improving robotic surgery performance: Eliciting haptic sensation by visual cues:**

**The „Feeling by seeing” method**

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**CANCELED**

We investigate a sensory-substitution phenomenon, whereby unattended peripheral dynamic visual-stimuli elicit haptic-sensation. Haptic feedback is essential for remotely-operated systems, such as surgical robots, which limits their use due to lack of haptic feedback. Our study provides methods foundations to improve robotic surgery performance. Participants' task was to maintain specific stylus pressures while tracking pre-defined routes. We used a pressure-sensing data-tablet. Routes, feedbacks and stylus-tip location were displayed on a wide-screen. Tracing line-color changes according to stylus-pressure served as "attended" feedback. A pulsating-ellipse displayed on the surrounding perimeter of the wide display screen served as peripheral-feedback. Its pulsating frequency reflected stylus pressure. Following acquisition trials (coupled color and peripheral cues), performance was examined with each of the feedback types, and without feedback. We performed two experimental phases: 1-"Haptic-sense present" (tracking on flat silicon-surface), 2- "Haptic-sense absent" (tracking on virtual-surface, preventing any haptic-sensation). 12 S's performed sessions of 40 acquisition trials, and 90 Test trials (3 pressure-levels X 3 feedback types). Performance without feedback was sharply degraded even with actual touching the surface ("Haptic-sense present"). In Test trials, peripheral and color feedbacks were found to be identical potent as feedback cues. 4 S's reported haptic sensation when "touching" the virtual surface.

**How to make loss aversion disappear and reverse:  
Tests of the decision by sampling origin of loss aversion**

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One of the key assumptions of prospect theory is loss aversion; the property of having a steeper value function for losses than gains. In the following paper, we offer a new psychological explanation of the origins of loss aversion based on the Decision by Sampling theory. We propose that the subjective value of a gain is derived from a series of ordinal comparisons with other gains in memory and the subjective value of a loss is derived from a series of ordinal comparisons with other losses in memory. In four experiments, we tested this proposition by manipulating the range of gains and losses that individuals saw during the process of eliciting their loss aversion parameter. We were able to find loss aversion, loss neutrality and even the reverse of loss aversion. These findings were consistent with the predictions of the Decision by Sampling model.

**On the measuring accuracy of the “Vehrs–Hebel”, a scaling apparatus  
for nonverbal real–time assessment of perceived quantity**

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In 1986 Wolfgang Vehrs introduced a bi–directional lever designed for the continuous, nonverbal and real–time assessment of subjective experience. Due to a centering mechanism providing haptic feedback on the lever position this scaling device provides precise measures even if the attention is focused on surrounding visual or auditory stimuli. To estimate the measuring accuracy, beside other methods, Vehrs instructed participants to match the lever position with randomly presented numbers ranging from either 1 to 5, 1 to 7 or 1 to 9, whereby the starting point for each of the matches was the center position at midpoint of the lever’s range. After conversation of the lever to allow digital registration of the lever positions we replicated these experiments. Unlike the procedure used by Vehrs, however, we asked for continuous scaling whereby the lever was not traced back to the center position. While we found a systematic bias in average lever positioning, the lever provided satisfactory results which favor the use of the lever for continuous ratings of bi–directional stimuli.

## The effects of absolute and relative importance on prospective memory

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In this study, we investigate under which conditions the importance of an intention affects prospective memory performance and ongoing task costs. The aim of the present study was to compare a relative importance instruction (i.e., emphasizing the prospective memory relative to the ongoing task) and an absolute importance instruction (i.e., emphasizing the prospective memory task only) to a control group. For the ongoing task, participants were engaged in a decision task which was embedded in a short-term memory task. They were additionally asked to press a designated key whenever a prospective memory target occurred. We expected to find higher prospective memory performance for both importance instructions compared to the control group. However, we expected no ongoing task costs in the absolute importance compared to the control condition, whereas ongoing task costs in the relative importance condition. The results confirmed to these expectations. They indicate that important intentions can improve prospective memory performance without additional ongoing task costs.

### Prozess- vs. Ergebnisverantwortlichkeit bei Urteilen und Entscheidungen:

#### Ein weiterer Fall nicht replizierbarer Befunde?

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Zahlreiche Studien aus der Urteils- und Entscheidungsforschung legen nahe, dass es „gute“ und „schlechte“ Verantwortlichkeit gibt: Während Verantwortlichkeit für das Ergebnis des Entscheidungsprozesses zu schlechteren Urteilen und Entscheidungen führt, soll Verantwortlichkeit für den Prozess der Entscheidungsfindung die Entscheidungsgüte verbessern. Da man Entscheidungsträger in der Praxis oft nicht aus einer Ergebnisverantwortlichkeit entlassen möchte oder kann, wollten wir untersuchen, ob die Induktion von Prozessverantwortlichkeit auch bei vorhandener Ergebnisverantwortlichkeit positiv wirkt. Bisherige Studien verfügten fast nie über die entsprechende Vergleichsbedingung mit beiden Verantwortlichkeitsformen. In vier Experimenten haben wir verschiedene Aufgaben eingesetzt, für die in der Literatur differentielle Effekte von Prozess- vs. Ergebnisverantwortlichkeit berichtet wurden (eine Hidden-Profile-Aufgabe in den Studien 1 und 4, eine Investitionsaufgabe in Studie 2 und eine Multi-Cue-Judgment Aufgabe in Studie 3). Über die bisherige Forschung hinausgehend haben wir Prozess- und Ergebnisverantwortlichkeit vollständig orthogonal in 2x2-Designs manipuliert. Unsere Analysen zeigten keine Interaktionseffekte für Prozess- und Ergebnisverantwortlichkeit. Weitaus gewichtiger ist, dass wir auch keinen der bisher publizierten differentielle Effekte für Prozess- vs. Ergebnisverantwortlichkeit auf die Urteils- und Entscheidungsqualität replizieren konnten –trotz zum Teil deutlich größerer Stichproben und stärkerer Manipulationen als in den Originalstudien. Die Ergebnisse werfen ein kritisches Licht auf die Verlässlichkeit der in der Literatur dokumentierten Befunde zur Prozess- vs. Ergebnisverantwortlichkeit.

### **What does it mean to be mentally fatigued?**

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Long lasting cognitive activity leads to a decrease in cognitive performance known as “mental fatigue”. Distracting information becomes more disturbing, actions become more error prone. Electrophysiological measures (EEG) have been proposed to be a reliable marker of this state. A large number of studies reported increased alpha activity with mental fatigue, indicating a general shift of the EEG towards slower frequencies. More recently the notion that alpha activity reflects mental fatigue has been challenged. In particular, the high stability of this measure in long lasting experiments indicated that alpha activity reflects rather a kind of running idle of the cognitive system than being a direct correlate of mental fatigue. Here, we present data from tedious tasks in a driving simulator. Participants had to go along a straight road with varying distraction for more than two hours. While alpha activity varied before most with the tiresomeness of the task, the coherence of EEG activity across frequency bands from 4 to 14 Hz revealed a reliable correlate of ongoing fatigue. Thus, when fatigue increases, not the decrease in processing speed but rather a lack in cortical synchronization becomes evident.

### **Categorical Perception of Emotion Expressions in Wholes and Parts of Faces.**

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The human face conveys a vast amount of information e.g. about identity, age, gender, and expressions of emotions. When observers judge facial expressions, they readily group them into distinct categories, with performance best described by a sigmoid function. One important question is, whether there are single diagnostic regions in the face that drive categorical perception, and how the information in those regions interacts, when presented in combination. We present results from two experiments with morphed fear/anger expressions, where (a) certain parts of the face are obscured and (b) composite faces made up of different expressions are presented. In fear/anger morphs using isolated parts, the eyes are found most diagnostic, while the mouth allows for a considerably lesser amount of accuracy. When a composite face consisting of mismatched upper and lower parts is used and judgements are instructed to rely on either mouth or eyes, the ‘to-be-ignored’ part always influences the perception of the target face region. However, the influence of the eyes on judgements of the mouth is much larger than vice-versa. This indicates that facial features which are most diagnostic in isolation, are those that will dominate categorical perception of emotion expressions, when part of a composite face.

## **Subliminal oculomotor capture: The role of contrast polarity**

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According to a top-down explanation of subliminal oculomotor capture, only subliminal distractors with a contrast polarity matching that of the searched-for targets should capture attention. When looking for white targets subliminal white but not black distractors should capture attention. In contrast, according to a bottom-up explanation of such capture effects, subliminal distractors with a contrast polarity different to that of the searched-for targets should also capture attention. Even when looking for white targets, subliminal black distractors should capture attention. We used subliminal singleton-onset distractors in the same vertical hemifield as the target versus singleton-onset distractors in the opposite vertical field to the target, and tested whether oculomotor capture by these distractors depended on a match between the searched-for target contrasts and the distractor contrasts, by measuring saccade latency, trajectory deviation, and endpoint deviation. We found evidence for oculomotor capture: subliminal distractors in the opposite field delayed saccade execution towards the target. This delay was found in comparison to subliminal distractors in the same hemifield as the target. In line with a bottom-up explanation, this delay was independent of the similarity between the distractor contrast polarity and the searched-for target contrast polarity. The experiment confirmed bottom-up oculomotor capture by subliminal singleton-onsets.

## **Looking at my offer: Procedural framing of negotiation proposals affects the sender's reference point of a transaction**

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In negotiation, procedural frames (i.e. framing proposals as offering own versus requesting others' resources) significantly influence parties' concession aversion. Recent research indicates that senders of negotiation proposals framed as offers rather than as requests are more concession-averse and attain better outcomes. The present research investigated whether and how procedural frames influence the sender's reference point (i.e. whether own or the counterpart's resources are focused). We predicted that offers would lead senders to focus on and thereby facilitate their response to their own resource, while equivalent requests would have the opposite effect. In three experimental tasks, participants first read out proposal frames (offers versus requests) and next saw pictures of their own and their counterpart's resources. Depending on the task, they then had to either quickly detect marked resources, or indicate the ownership of a single resource, or match resources to previously presented ones. When procedural frames and focused resources matched (i.e. offer-own resource and request-opponent's resource combinations), senders of proposals reacted faster at detecting and identifying resources and more accurately matched resources to previous ones as compared to non-matching combinations. In sum, our findings support the view that procedural frames influence concession aversion via the sender's reference point.

**Accurately perceived, falsely retrieved: Illusory correlations originate  
from biased retrieval of accurately encoded contingencies**

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Illusory correlations (ICs) are subjective covariation judgments that differ systematically from factual contingencies. When stereotyping, people build up associations between majorities and frequent, desirable behavior, as well as between minorities and infrequent, undesirable behavior, even when group membership and behavior are actually uncorrelated. Most prominent theories assume that ICs originate from the high accessibility of distinctive memory traces or result from random forgetting of group–behavior combinations. Recent studies, however, have challenged such views and proposed that ICs may already be built up during encoding. We tested these controversial hypotheses by using an online questionnaire. Participants studied descriptions about members of a majority and members of a minority behaving either in a desirable or an undesirable way, with group size and desirability of behavior being negatively correlated. While encoding measures revealed that participants accurately perceived this negative correlation, a positive IC between group size and desirability of behavior was observed at retrieval (as measured by frequency estimations, evaluative ratings and group assignments). Furthermore, the perceived correlation between group size and desirability of behavior at encoding was unrelated to the extent of IC at retrieval. Thus, ICs can be assumed to result from post-encoding processing.

**SNARC meets SPARC: Automaticity and Interdependency in Compatibility Effects**

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It is inconclusive whether effects of Stimulus–Response–Compatibility (SRC), such as the Spatial Numerical and Spatial Pitch Association of Response Codes (SNARC and SPARC effects) are independent of each other, as suggested by domain specificity of concepts such as the mental number line or the musical scale, or interdependent, for instance because their coding dimensions overlap or because they share a common decision mechanism. Over two experiments, participants were auditorily presented with numbers sung in different pitches in a factorial design, allowing us to study SNARC and SPARC effect simultaneously. Participants judged numerical magnitude (small – large), pitch (low – high), or parity (odd – even) of the stimuli. In the magnitude judgment task, numerical magnitude would be explicit and pitch implicit; in the pitch judgment task, it is vice versa, whereas in the parity judgment task, both dimensions would be implicit. Since SNARC and SPARC effects occurred in all tasks, irrespectively of whether they were implicit or explicit, we concluded that they are automatic. Additionally, SNARC and SPARC effects show a super-additive interaction, interpreted in terms of a common mechanism for both effects.

## SNARC meets SPARC in the MRI – interdependence of compatibility effects depends on the content

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Stimulus–Response–Compatibility (SRC) plays a major role in choice–reaction tasks. In specific cases, such as number or pitch processing, SRC leads to phenomena, like the Spatial Numerical Association of Response Codes (SNARC) or the Spatial Pitch Association of Response Codes (SPARC) effect. In those compatibility effects small numbers or low pitches lead to faster responses with the left hand, whereas large numbers or high pitches lead to faster responses with the right hand, respectively. Here, we investigate the underlying neural activity when it comes to a combination of SNARC and SPARC by using the same auditory stimuli, i.e. numbers spoken in different pitch heights. A behavioral study, using the same stimulus set, points to an automaticity of both effects. To further investigate the behaviorally found super–additive interaction, we investigated the neural activity during magnitude judgment in an event–related fMRI study. The results showed an interaction between the compatibility effects in bilateral auditory cortex and anterior insula, depending on the content of the stimuli. This interaction differs from numerical magnitude to words without any discrete magnitude information, just indicating “small” and “large”. We conclude that SNARC and SPARC are interdependent and occur automatically, but depended on the semantic content of the stimuli.

## Bodily reactions during reading of emotion words differentiate good from bad and self from other: Evidence from facial muscle activity, heart rate and electrodermal activity.

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Research Background: Social, cognitive and affective neuroscience suggests that emotion and language are closely related. Here, a multimodal paradigm to investigate emotional processing of words is presented. Method: Word phrases consisting of pronoun–noun–combinations were presented on a computer screen. Nouns varied in valence (positive/neutral/negative), pronouns in self–reference (self/other/negation), resulting in a 3\*3 design. The subject’s task was to judge the emotional valence of the words. Reaction times, skin conductance (EDA), facial expressions (fEMG) and heart rate (HR) were recorded. Results: Pronoun–noun–phrases with positive or negative nouns were evaluated faster than pronoun–noun–phrases with neutral nouns. Self–related positive pronoun–noun phrases (e.g. my happiness) were responded to the quickest. Emotional pronoun–noun pairs elicited an increase in phasic heart rate compared to phrases of neutral meaning. The same pattern emerged for electrodermal activity while fEMG varied as a function of both, stimulus valence and self–reference. Conclusion: The self–positivity bias in reaction time data is in congruence with the self–serving attributional bias in Western culture. Spontaneous valence judgments altered bodily responses as a function of the word’s personal reference and its emotional content. These findings support the embodied nature of emotions in language. However, fEMG data indicates facial muscles to furthermore react to personal reference.

**Control of distractor processing: benefit without cost of attending to the location  
of (congruent and incongruent) distractors**

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Successful selection of a target stimulus presented among distractor stimuli, competing for response, has been attributed to the allocation of visual attention to the location of the target. Location-based allocation of attention has also been investigated in spatial cuing tasks, in which responding to a target stimulus is facilitated when the target is presented in a location indicated by an advance cue. Applying spatial cuing in a “temporal flanker task”, we investigated the control of allocation of attention to distractors. On each trial an arrow-shaped cue indicated the probable location of the trial’s target. Before the target was presented, a congruent or incongruent distractor occurred randomly in the cued or in an uncued location. Responding in congruent trials was facilitated when the distractor occurred in the cued location, whereas responding in incongruent trials was unaffected by cuing, resulting in a larger congruency effect evoked by distractors that occurred in the cued location. These results can be explained by assuming enhanced processing of stimulus identity information presented in the cued location and general (i.e., identity-unrelated) disruption of processing by a stimulus occurring in an uncued location.

**Go/no-go evaluative priming: near or remote relative of standard evaluative priming?**

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Recently, we introduced a go/no-go version of evaluative priming (de Paula Couto & Wentura, 2012): Each trial starts by a cue indicating which valence is the go-category; the cue is followed by the prime-target sequence. Participants were instructed to press a key if the target valence matches the cue. With Experiment 1, we compared a standard version of evaluative priming with the go/no-go version, using a response window technique (i.e., accuracy was the dominant variable). Coherent with a response interference account, we found a Gratton effect (i.e., weaker priming following incongruent trials) for the standard version. There was no evidence for this in the go/no-go variant. Therefore, with Experiment 2, we tested an alternative account of the go/no-go version: Prime and target form a compound that is matched against the cue. A congruent compound either signals a clear match or non-match; accordingly, accuracy is high. Incongruent compounds constitute a partial match: one part of the compound matches the cue and one part of the compound mismatches it. The hypothesis can be derived that the balance of priming in go and no-go trials is predicted by the individual response criterion. By manipulating this criterion, Experiment 2 provided evidence for this claim.

## **One thing at a time: The temporal dynamics of goal-shielding**

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Goal activation triggers automatic self-regulation mechanisms that facilitate goal-pursuit. For example, previous research has shown that currently active goals are evaluated more positively than are competing distractors. However, these studies always compared evaluations of already existing goals and distractors, thus confounding goal content with the role of pursued vs. distracting goals. The major aim of our study was to eliminate this confound and to investigate the temporal dynamics of evaluative goal shielding. For this purpose, two goals were activated successively (an academic and a social goal, the sequence of the activation was counter-balanced across participants). Implicit evaluations of the goals were measured before and after the introduction of a second, potentially distracting goal, using an IAT. The results show that the goal that is introduced first is shielded against the second goal by a heightened positive evaluation and by the devaluation of the distracting goal.

## **Moving hands and jars: Interaction of sensorimotor information and problem presentation**

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The embodied cognition approach can be understood as a bidirectional link between the human body and cognitive functions. Thereby this interplay has been shown also for the so-called higher cognitive functions, for example problem solving. However the interplay with the different stages of the problem solving process are unclear, that is whether a movement manipulation change the initial problem representation via guiding the gaze behavior, has the potential to generate insight to the problem or both. To answer this question we tested 53 participants with a simple perception task and a variation of Luchins' (1942) water jar problem that allows two solutions to each problem task (addition or subtraction). We used simple arm movements to the left or right and additionally two different ways of presenting the problem tasks. As a result we found an effect of movement manipulation on gaze behavior in the perception task but not in the problem tasks. Combining problem representation and the arm movements in a congruent way revealed significant effects on the problem solutions. Based on these results we can assume that sensorimotor information has the potential to affect the problem representation as well as to facilitate the insight in problem solving.

## **Spatial Negative Priming: In Touch, It's All About Location, Location, Location**

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Responding to a previously ignored stimulus as compared to responding to a stimulus that has not been presented previously has often been shown to be prolonged (identity negative priming). Similarly, responses towards stimuli occurring at previously ignored locations are slowed down (spatial negative priming, SNP). Negative priming has been investigated in vision, audition, and touch. Importantly, while identity negative priming seems to be comparable across these three modalities, different cognitive processes have been suggested to be involved in SNP. While SNP seems attributable to feature mismatch in audition, visual SNP studies suggested response inhibition as the underlying mechanism for SNP in vision. In touch, it has recently been found that SNP is not modulated by feature mismatch. The current research indicates that response inhibition does not contribute to tactile SNP. We conclude that in touch, SNP is attributable to inhibition of the prime distractor location. Intriguingly, SNP is thus caused by different cognitive processes depending on the stimulus modality.

## **Spatial Information in Non-Spatial Problem Solving: Useful and/or Detrimental?**

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Spatial information processing is elementary for intelligent behavior. Consequently humans evolved efficient processes for processing space independent of information modality. In two experiments we studied whether this causes spatial information to permeate mental representations in problem solving within non-spatial domains. First we tested the participants' abilities to use spatial information in an analogy between a spatial base to a non-spatial target. We found participants readily used spatial information in a non-spatial domain. Furthermore participants enriched their representation with distance information besides the direction clues crucial for a correct analogy. This led to the follow-up question whether spatial information's salience causes it to force itself upon the mental representation, and thus becoming hindering when conflicting with the problem structure? In the second experiment participants played a Tic-Tac-Toe isomorph differing in spatial layouts: either consistent, neutral or conflicting with the problem structure. Spatial information was not crucial to solving the task. The results show that participants used spatial information to discern the problem structure in the consistent condition but were not hindered by conflicting information. This indicates that problem solvers adapt their mental representation, seeking spatial information for aid but ignoring it if it's deemed unhelpful.

## **Semantic congruency and the (reversed) Colavita effect in children**

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When presented with auditory, visual, or bimodal audio–visual stimuli in a discrimination task, adults tend to ignore the auditory component in bimodal stimuli and respond to the visual component (Colavita visual dominance effect, Colavita, 1974). Young children, in turn, are dominated by the auditory component of bimodal stimuli (Nava & Pavani, 2012). This suggests a change of sensory dominance in the course of development. The aim of our study was to investigate whether children and adults show sensory dominance effects when presented with complex, semantic stimuli and whether these dominance effects can be modulated by semantic (in–)congruency. Semantic (in–) congruency did not affect the magnitude of the auditory dominance effect in 6–year–olds and visual dominance effect in adults, but was a modulating factor of the visual dominance in 9–year–olds. Our results suggest (1) that sensory dominance in children and adults can be extended to complex, meaningful stimuli and (2) that sensory dominance is more robust in 6–year–olds and adults than in 9–year–olds, implying a transitional stage around this age.

## **Die Veränderung der Zeitwahrnehmung über die Lebensspanne**

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Der Alterseffekt der Zeitwahrnehmung ist ein Phänomen, das viele Menschen ab einem bestimmten Alter kennen (Friedman & Janssen, 2010; Wittmann & Lehnhoff, 2005). Es scheint so, als würde die Zeit zunehmend schneller vergehen, je älter man wird. Dazu gibt es bereits eine Fülle unterschiedlicher Erklärungsansätze und Theorien. Ziel der vorliegenden Untersuchung war es, im Rahmen einer Fragebogenuntersuchung eine empirische Vergleichsanalyse dieser Ansätze durchzuführen. Anhand einer Stichprobe ( $n = 600$ ) im Alter zwischen 15 und 89 Jahren wurden sowohl das Zeitempfinden als auch die in der Forschungsliteratur genannten Einflussfaktoren auf die Zeitwahrnehmung erfasst. Es wurden dabei nicht nur die Angaben der Probanden zur Beurteilung der aktuellen Lebenssituation zum Befragungszeitpunkt, sondern auch der Verlauf rückblickend über die gesamte Lebensspanne erhoben. In Bezug auf das Zeitempfinden in der aktuellen Lebenssituation zeigt sich, dass dies deutlich mit dem täglich empfundenen Zeitdruck sowie dem Ausmaß an Routinen im täglichen Leben zusammenhängt. Das Zeitempfinden rückblickend über die Lebensspannen wird jedoch zusätzlich von der Anzahl neuer Lebenserfahrungen beeinflusst. Je mehr neue Lebenserfahrungen in einer Lebensperiode erinnert wurden, desto langsamer schien die Zeit für die Probanden zu vergehen. Das Ausmaß an Angst vor dem Lebensende schien hingegen nur einen geringen Einfluss auf die Zeitwahrnehmung zu haben. Die Ergebnisse werden hinsichtlich einer Einbettung in vorhandene Modelle zur menschlichen Zeitwahrnehmung betrachtet.

## **“Stopp!” – Warnungen wirken, allerdings manchmal vielleicht zu stark**

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Der urbane Raum stellt den Fahrer mit seinen komplexen Fahr- und Verkehrssituationen vor besondere Herausforderungen. Er trifft auf viele ablenkende Reize, hohe Informationsdichte und zeitliche Dynamik bei kurzen Entscheidungszeiten und Handlungsspielräumen. Entsprechend hoch ist dort das Unfallrisiko. Im Rahmen des Projekts UR:BAN (gefördert durch das BmWi) werden auf Basis von Unfallanalysen Konzepte für warnende Fahrerassistenzsysteme entwickelt. Die wesentliche Frage war, inwieweit unterschiedliche Warnziele (Aufmerksamkeit lenken vs. Notbremsung) und unterschiedlich spezifische Informationen (z.B. „Achtung“ vs. „Fußgänger“) dazu führen, dass die Fahrer möglichst früh adequat auf die kritische Situation reagieren. Dazu wurden im statischen Fahrsimulator der TU Braunschweig verschiedene kritische Situationen entsprechend der Unfallanalysen umgesetzt. Das Fahr- und Blickverhalten von 60 Probanden wurde bei vier unterschiedlichen Warnkonzepten im Vergleich zu einer Kontrollgruppe in einem unabhängigen Versuchsplan untersucht. Insgesamt zeigten sich positive Effekte der Warnungen gegenüber der Fahrt ohne Warnung. Allerdings zeigten sich teilweise sehr unterschiedliche Bremsreaktionen. Bei einer generischen, handlungsorientierte Warnung („Stopp“) reagierten die Fahrer zumeist sehr schnell, allerdings auch mit einer sehr starken Bremsung. Diese starke Reaktion war jedoch nicht in allen untersuchten kritischen Situationen notwendig und könnte bei etwaigen Folgefahrzeugen zu neuen, kritischen Situationen führen. In zukünftigen Studien soll untersucht werden, ob ein situationsangepasstes Warnkonzept zu adäquateren Reaktionen führen kann.

## **Altersunterschiede in Verstärkung und Verminderung negativer Emotionen**

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Prominente Lebensspannentheorien postulieren, dass ältere Erwachsene ihre Emotionen häufiger und besser regulieren können als junge Erwachsene, weil sie ein besonderes Interesse daran haben, negative Emotionen abzuschwächen bzw. zu vermeiden. Bisher wurden jedoch nur wenige altersvergleichende experimentelle Arbeiten zur willentlichen Emotionsregulation vorgelegt und es stellt sich insbesondere die Frage, ob neben Altersunterschieden in der willentlichen Verminderung negativer Emotionen auch Altersunterschiede in der willentlichen Verstärkung negativer Emotionen feststellbar sind. Dies untersuchten wir in einer experimentellen Studie mit jeweils 42 jüngeren (M Alter = 26) und 42 älteren Erwachsenen (M Alter = 70), denen 54 Bilder des International Affective Picture Systems (IAPS) in drei Bedingungen präsentiert wurden, die sich in der instruierten Aufmerksamkeitslenkung voneinander unterschieden. Als abhängige Variable diente die subjektive negative Gefühlsintensität (Valenz) während der Betrachtung der Bilder. Unsere Analysen ergaben, dass ältere Erwachsene ihre negativen Gefühle ebenso gut abschwächen konnten wie die jüngeren Erwachsenen. Allerdings deuten die Befunde darauf hin, dass ältere im Vergleich zu jüngeren Erwachsenen weniger effizient darin waren willentlich ihre negativer Gefühle zu verstärken. Dieses Ergebnismuster ist konsistent mit der Annahme, dass nicht alle Formen der Emotionsregulation von altersbezogenen Gewinnen gekennzeichnet sind.

### **Difficulties and aftereffects of rule violations**

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Most of our daily life is organized around rules and norms. But what makes them so special? And what if one were to intentionally break a given rule? To discuss the behavioral parameters of rule violations, we conducted a series of experiments on an iPad, which allowed us to track the participants' finger-movements on the touchscreen. Our experiments show that rule-violation behavior is distinctly different from rule-based actions in both, response times and movement trajectories. Data not only shows differences between the two types of response (rule-based vs. violation), but also depicts distinct aftereffects of rule-violations. This allows for a first step at understanding the signature of non-conformity.

### **Rapid in, rapid out? How stable are rapidly acquired response-effect associations?**

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In order to flexibly behave in a goal-directed manner we have to rapidly extract the relation between our actions (R) and their effects (E), given the current stimulus context (S). In fact, less than ten encounters are needed to form such (S-)R-E associations even if they are rather arbitrary. However, it is of yet unknown how stable these associations are, especially in extinction, which considerably decreases the behavioral impact of action-effect associations. The present study addressed this question using a rapid learning version of the action-effect induction paradigm. In each block, participants first learned action-effect associations while responding according to a novel S-R rule. Thereafter they responded to these previous action-effects in a manner that was either compatible or incompatible with the acquired action-effect association. In order to probe the stability of these associations, the test-phase was substantially longer than the learning-phase. Furthermore, action-effects were presented in the test-phase in only one group of participants but not the other, thus preventing or enabling extinction learning. The results are straightforward. Rapidly learnt action-effect associations cease to affect behavior, at least temporarily, under extinction rather quickly. This suggests that rapidly learnt action-effect associations are equally rapidly restructured to accommodate novel action-effect contingencies.

## Brummt der Bär links oder rechts? Räumliche Assoziationen beim Sprachverstehen und die Rolle musikalischer Expertise

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Der Simulationsansatz des Sprachverstehens basiert auf der Annahme, dass Sprachverstehensprozesse auf einer Reaktivierung sensorischer und motorischer Erfahrungen basieren. Es wird angenommen, dass bestimmte Aspekte dieser Erfahrungen die Grundlage der Bedeutungsrepräsentation beim Sprachverstehen bilden. Diese sensomotorischen Erfahrungen werden demnach beim Lesen/Hören der entsprechenden Wörter bzw. Sätze aktiviert. Studien im Bereich der auditiven Verarbeitung zeigten, dass nur Pianisten eine automatische Assoziation zwischen Tönen und horizontalem Raum zeigen (hoch/rechts, tief/links), entsprechend der Erfahrung, die beim Klavierspielen gemacht wurde. Die vertikale automatische Assoziation von Tonhöhe und Raum (hoch/oben, tief/unten) findet man hingegen auch für andere Probandengruppen. In meiner Dissertation soll untersucht werden, ob sich diese Befunde auf den Bereich der Sprachverarbeitung erweitern lassen. Als Stimulusmaterial sollen hier Sätze verwendet werden, die inhaltlich einen hohen oder tiefen Ton ausdrücken, z.B. der Bär brummt tief vs. der Pianist spielt einen hohen Ton. Es wird untersucht, ob bei der Sprachverarbeitung ähnliche räumliche Assoziationen entstehen wie beim Hören auditiver Stimuli. Des Weiteren soll durch den Vergleich von Pianisten vs. Nichtmusikern die Rolle musikalischer Expertise beim Sprachverstehens untersucht werden. Zu Letzt sollen die zu Grunde liegenden Mechanismen der Assoziation zwischen Raum und Tonhöhe untersucht werden.

## Tear jerker or “Ick” factor? The amplification effect of disgust in charitable giving

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CANCELED

While the role of emotions in charitable giving has generated much interest, the role of specific emotions on such decisions is less well understood. In two studies we examine the role of sadness and disgust in real donation decisions. In Study 1 we investigated whether sad and disgusting images of needy children differed in the levels of sadness, anger, or disgust, and whether increases in these negative emotions lead to increases in the amount of sympathy felt, and the predicted impact of a potential donation. We find disgusting images lead to greater increases in the sympathy, as well as the predicted positive impact of a donation, compared to sad images. Interestingly, these increases are mediated by increases in feelings of sadness. In Study 2 we replicate and extend these findings, showing that through sympathy and impact, disgust leads to increases in the likelihood that a monetary donation will be made, as well as the amount given. This pattern of results suggests that in spite of the aversive nature of disgust, its amplification effect on other negative emotions may in fact lead to increased approach behavior in the domain of charitable giving.

## **Musical training improves short-term memory for serial order**

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The present study investigates the impact of musical training on two mechanisms of short-term memory: memory for content and memory for serial order. Two groups of participants performed in two tasks. The first group consisted of music students each of which played two instruments for, on average, eleven years. The second group consisted of students who never learned to play a musical instrument. The two tasks were variants of the Sternberg task. Each trial started with the serial presentation of five to seven consonant letters (memory list). Each memory list was followed by a memory probe that differed between tasks. In the item-probe task, the probe was a single letter that matched a letter from the memory list or not. In the list-probe task, the probe was a list composed of the letters from the preceding memory list that were presented in the original order or not (in the latter case, two adjacent letters had changed positions). Results revealed that the musical group performed better than the non-musical group in the list-probe task, whereas both groups performed equally well in the item-probe task. Hence, several years of musical training improve short-term memory for serial order of verbal material.

## **The pitfalls of modeling valuations from experience**

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What are the cognitive mechanisms underlying valuations based on sequentially experienced samples of an option's possible outcomes? Ashby and Rakow (2014) have proposed a sliding window model (SWIM), according to which people's valuations represent the average of a limited sample of recent experiences (the size of which is estimated by the model) formed after sampling has been terminated (i.e., an end-of-sequence process). Ashby and Rakow present results from which they conclude that the SWIM performs well compared to alternative models based on model selection criteria (value-updating model, summary model). We highlight several problematic issues with the conclusions drawn by Ashby and Rakow. In a reanalysis of their data, we find no clear evidence in support of any of the models tested, but with a slight advantage for the summary model. Further, we demonstrate that individual differences in the window size estimated by the SWIM can reflect differences in judgment noise. Model recovery analyses reveal that the flexibility of the models tested by Ashby and Rakow depends on a complex interplay of sample size and noise, precluding unequivocal conclusions regarding the underlying mechanism on the basis of the data presented. We discuss approaches to improve model comparisons in valuations from experience.

## **Examining similarities and differences of intuitive and insight solution processes**

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When scrutinizing theoretical definitions of intuition and insight, it seems convincing that intuitive processes may precede insight problem solving. The paradigmatic level however, reveals differences with respect to the tasks used to foster intuitive versus insight processes. In the semantic domain, word triads have been used, yet the tasks' underlying rationale is different for the two phenomena. In intuition research, intuitive processing has been investigated via coherence judgments performed without an explicit basis. Triads, either semantically coherent or incoherent are used. In coherent triads a common concept exists that means the same vis a vis each of the triad's constituents (i.e. convergent triads). It is examined whether participants are able to differentiate between the two types without verbalizing this concept. In contrast, in insight problem solving the main focus is on explicit solutions of triads and its accompanying signal(s). To that end, mainly divergent triads are used (i.e., the common concept means something different vis a vis each of the triad's constituents). Problematically, these two research strands have developed separately from each other. Based on this, however, using convergent and divergent triads in the same task and within the same participants is suggested to test whether insight builds on intuition, or whether we face two completely distinct (solution) processes.

## **Foreground-background segmentation and implicit learning in contextual-guided visual search**

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Implicit learning of invariant spatial context in a complex visual environment can guide attention to the target location, which is known as contextual cueing (Chun 1998). It has been shown that selective attention can influence contextual learning (Jiang & Leung, 2005). On the other hand, the segmentation process also influences the selective attention (Wolfe, 2003). However, whether foreground-background segmentation affects contextual cueing is still not clear. We conducted three experiments to examine the dependency of contextual cueing on the foreground/ background segmentation. In the experiments, together with a classical contextual search display (a 'T' and 'Ls'), we presented a geometric cuboid frame, which was not changed during the training session, but was either rotated 90° or removed in the subsequent test session.. The cuboid was manipulated as the foreground information in Experiment 1, and as the background information in Experiments 2 and 3. The results showed that the contextual cueing effect was manifested in the training session across all experiments. However, the cueing effect diminished when the cuboid was changed or removed in Experiment 1, but not in Experiments 2 and 3. The findings suggest that segmentation process is prior to the contextual learning process. When the cuboid and search array were both selected in the learning phase, changes of cuboid can destroy the learned contexts. In contrast, when the cuboid was automatically segmented out from the search array, it has little influence on the contextual learning and retrieval.

## Voice Processing Under Visual Load

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Adaptation to female voices causes subsequent voices to be perceived as more male and vice versa. This contrastive aftereffect disappears under spatial inattention to adaptors, suggesting that voices are not encoded automatically. According to Lavie et al. (2004), processing of task-irrelevant stimuli during selective attention depends on perceptual resources and working memory. Faces may be an exceptional domain: task-irrelevant faces can escape perceptual load effects. Here we test voice processing, and study if voice gender aftereffects (VGAE) depend on low or high perceptual (Exp. 1) or working memory (Exp. 2) load of a relevant visual task. Participants adapted to irrelevant voices while either searching digit displays for a target (Exp. 1) or recognizing studied digits (Exp. 2). Intriguingly, the VGAE was unaffected by perceptual load, indicating that task-irrelevant voices can also escape perceptual load effects. By contrast, the VGAE was increased under high memory load. Therefore, visual working memory, but not general perceptual load, determines the processing of task-irrelevant voices.

## Modeling Social Influence on Human Decision-Making with Reinforcement Learning Theory

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One of the main challenges in decision neuroscience lies in the fact that humans do not make decisions alone, but rather are affected by social environment. Besides making choices according to the action-outcome association, humans tend to align themselves with the others, even without any direct social interaction. However, relatively little is known about what is the nature of the computations carried out by human minds to achieve optimal decisions when social influence is presented. To fill this gap, we developed a novel experimental paradigm which allows for investigating real-time interaction between multiple players while engaging in a probabilistic decision-making task under uncertainty. Behaviorally, participants tend to switch their choice to adjust themselves to the collective decision. Further, by employing cognitive models with reinforcement learning (RL) framework, we show that the decision-making process involves a reward prediction error (RPE) together with a social prediction error (SPE). We find that the hybrid social-RL model with weighted combination of RPE and SPE could provide a better fit to participants' behavior than does RL model with RPE or SPE alone. These findings provide evidence that social influences exerted by the group members could be computed in the human mind to reach better performance.

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