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What we know (and do not know) about prepulse inhibition of startle
Terry D. Blumenthal - Wake Forest University, Winston-Salem, NC USA

The startle reflex is a phylogenetically old and very sensitive constellation of responses that serve both defensive and interruptive properties. Startle can be measured in a range of animal models, and in humans across the lifespan. This response is very sensitive to variations in stimulus and situational parameters, personality characteristics, clinical diagnoses, and pharmacological, social, and cognitive situations. One intriguing property of startle is the fact that it can be profoundly inhibited by the presentation of an otherwise innocuous stimulus, called a prepulse, shortly before the startle stimulus. This prepulse inhibition (PPI) of startle is a very reliable and robust effect, attenuating the startle response completely in many cases. PPI can vary based on a multitude of stimulus, situation, and person parameters, and some of those factors will be discussed in this presentation. Information about the sensitivity and utility of PPI will also be provided, suggesting applications in a variety of areas in psychology and neuroscience. An effort will also be made to correct some misconceptions about PPI, and to point toward future developments in the application of this exceedingly sensitive and useful measure.

Lernen, Gedächtnis und Plastizität des Gehirns: Implikationen für Verhaltensänderung
Herta Flor - Zentralinstitut für Seelische Gesundheit, Mannheim


Mit Unterstützung von SFB636 (Psychopathologie), SFB1158 (Thema Schmerz) und einem Reinhart-Koselleck-Projekt der Deutschen Forschungsgemeinschaft.

Bidirectional effects of early life adversity on stress system regulation – in search for a comprehensive theory
Jens Prüssner - Universität Konstanz

Early life adversity (ELA), in the form of low parental care or overprotection, or physical, sexual, or emotional abuse, is consistently linked to poor mental health outcomes in adulthood, including psychosis, depression, and burnout. A generally agreed-upon mediator of these effects is a changed regulation of the stress / energy systems in the organism, namely the autonomic nervous system (ANS), and the hypothalamic-pituitary adrenal (hpa) axis. Investigated in both human and animal studies, these systems are consistently found dysregulated in organisms exposed to ELA, however the directionality is unclear, with some studies demonstrating heightened activity, while others show blunting of the biomarkers of the system, after exposure to adversity early in life.

Several theories exist that try to explain these mixed effects, considering factors like age of exposure, trauma severity, duration, or type. Importantly, none of the theories can be used to explain all of the available data, suggesting that additional factors / mediators might be at play.

The current talk will summarize the major theories in the field and point out some of the commonalities and differences among them. In addition, it will introduce potential mediators that are currently not incorporated in the theories but that might be important to consider to better understand the ELA / stress response system relationship.
Stress and the brain – effects of type and timing of adversity on brain structure and function

Dennis Golm & Robert Kumsta

King’s College London, IOPPN, Vereinigtes Königreich
Raum: HS 1

"Adverse experiences are a major risk factor for later life psychopathology, especially if they occur during sensitive periods of development early in life or during adolescence. Those experiences can include, but are not limited to, sexual or physical abuse, socio-emotional neglect experienced by institutionalised children or serious life events. Various mechanisms have been discussed through which those risk factors lead to later-life problems such as abnormalities in brain structure and function. The aim of this symposium is to explore neurobiological correlates of various risk factors experienced early in life and during adolescence in the context of longitudinal research designs. Claudia Buss will present evidence for alterations in brain anatomy in new-borns of mothers who were exposed to childhood maltreatment and discuss potential intrauterine mechanisms that may underlie this intergenerational transmission. Dennis Golm and Nuria Mackes will present structural and functional brain imaging data from the longitudinal English and Romanian Adoptees Study, a study of Romanian adoptees who experienced severe institutional deprivation in orphanages under the Ceausescu regime and who are still largely affected by mental health problems in young adulthood. Finally, Raffael Kalisch will present data from the Mainz Resilience Project that aims to build up a cohort of healthy young volunteers in the transition between adolescence and adulthood. The aim of this project is to explore stress factors and predictors of successful coping and resilience."

Brain structural alterations in newborns of mothers exposed to childhood trauma

Buss, Claudia; Moog, Nora; Entringer, Sonja; Rasmussen, Jerod; Styner, Martin; Gilmore, John; Heim, Christine; Wadhwa, Pathik

Charité Universitätsmedizin Berlin, Deutschland

"Childhood trauma (CT) confers deleterious long-term consequences and growing evidence suggests some of the effects may be transmitted across generations. We sought to elucidate whether changes in infant brain structure were already visible shortly after birth to address the hypothesis that such intergenerational effects start in utero. The prospective longitudinal study was conducted in a population-based sample of 80 mother-child dyads. Maternal CT exposure was assessed using the Childhood Trauma Questionnaire. Structural magnetic resonance imaging (MRI) was employed to characterize newborn brain anatomy near the time of birth. Maternal CT exposure was associated with lower intracranial volume in their children (F(1,72)=7.05, p=0.01), which was primarily due to a global reduction in cortical gray matter (F(1,72)=9.32, p=0.003). The effect was independent of gestational age at birth and postnatal age at MRI scan, obstetric complications, maternal socioeconomic status, maternal depression during pregnancy and infant sex. Furthermore, newborn gray matter volume was a significant mediator of the pathway linking maternal CT exposure with infant social-emotional development (indirect effect ab: -.831, 95% CI [-.211, -.18]). These findings represent the first report to date linking maternal CT exposure with structural alterations in their newborn’s brains and connecting this association to infant social-emotional development. These two observations support our hypothesis that the intrauterine period of life may represent a particularly sensitive developmental window in terms of the intergenerational transmission of maternal CT-related effects and their potential consequences."
The long term neurobiological impact of early global institutional deprivation: Imaging brain structure and function in the English and Romanian Adoptees Study

Golm, Dennis (1); Mackes, Nuria (2); Sarkar, Sagari (1); Kumsta, Robert (3); Fairchild, Graeme (4); Mehta, Mitul (1); Sonuga-Barke, Edmund (1)
1: King’s College London, Vereinigtes Königreich; 2: University of Southampton, Vereinigtes Königreich; 3: Ruhr Universität Bochum, Deutschland; 4: University of Bath, Vereinigtes Königreich

“Background: Childhood neglect has been associated with structural and functional brain alterations (Teicher et al., 2016). However, because of methodological limitations it has been challenging to establish whether such effects are causal in nature. In the current talk we report preliminary results from the English and Romanian Adoptees Brain Imaging Study to address this limitation. Our participants experienced severe deprivation in Romanian orphanages of the Ceausescu regime. At the regime’s fall in 1989, they were adopted internationally to an above average adoptive home. The participants have now been followed up into young adulthood. For many of those with longer periods of deprivation problems persisted into young adulthood – especially in the domains of ADHD, ASD and disinhibited social behaviour (Sonuga-Barke et al., 2017).

Methods: The original sample comprised of 165 Romanian adoptees and a control group of 52 UK adoptees who have been assessed at 4, 6, 11, 15, 23 and 26 years. In the latest follow-up we were still able to recruit about 44% of the original sample (still running until 31/03/2017). The Romanian adoptees were further divided into a high and a low deprivation group. As part of the assessment participants underwent a number of functional imaging tasks that assessed resting-state, threat detection, emotional and reward processing.

Results: Preliminary functional brain imaging data will be presented and discussed in the context of current maltreatment research. Data focusing mainly on one specific type of maltreatment is scarce and we will discuss potential unique effects of type of maltreatment.”

Early institutional deprivation is associated with long-term alterations in brain structure: First insights from structural brain imaging in the English and Romanian Adoptees Study

Mackes, Nuria (2); Golm, Dennis (1); Sarkar, Sagari (1); Kumsta, Robert (3); Fairchild, Graeme (4); Mehta, Mitul (1); Sonuga-Barke, Edmund (1)
1: King’s College London, Vereinigtes Königreich; 2: University of Southampton, Vereinigtes Königreich; 3: Ruhr-Universität Bochum, Deutschland; 4: University of Bath, Vereinigtes Königreich

“Background: Early maltreatment can have long-lasting effects on mental health and has been associated with global and widespread alterations in brain structure. In this talk, we report preliminary findings from the English and Romanian Adoptees (ERA) Brain Imaging Study, which is the first study to examine the long-term effects of early institutional deprivation on brain structure in young adulthood.

Methods: This preliminary analysis included 21 UK adoptees, who did not experience institutional deprivation, and 70 Romanian adoptees (42% of the original sample). Additionally, a newly recruited group of 40 healthy non-adopted controls was included. Structural MRI scans were parcellated and a whole brain analysis examined differences in cortical volume, surface area and thickness.

Results: Romanian adoptees showed smaller total intracranial volumes (tICV) in comparison to UK adoptees and healthy controls. Within Romanian adoptees, there was a weak negative correlation between tICV and length of deprivation. UK adoptees showed no significant difference to healthy controls in tICV. In this talk we will present preliminary results on group differences in brain morphometry while controlling for age, gender, IQ and tICV.

Discussion: Early institutional deprivation is associated with global long-term reductions in intracranial volume and is hypothesised to be related to widespread alterations in brain morphometry. We will discuss the effects of length of deprivation as well as potential unique effects of institutional deprivation compared to adoption without experience of institutional deprivation. The results will be discussed in context of the behavioural outcomes of the ERA study and current early maltreatment research.”
MARP and LORA: next generation resilience studies

Kalisch, Raffael (1); Reif, Andreas (1,3); Lieb, Klaus (1); Tüscher, Oliver (1); Wessa, Michèle (1,2); Fiebach, Christian (1,3); Lutz, Beat (1); Kampa, Miriam (1); Schick, Anita (1); Chmitor, Andrea (1); Sebastian, Alexandra (1); Yuen, Kenneth (1)

1: Universitätsmedizin Mainz, Deutsches Resilienz-Zentrum, Deutschland; 2: Johannes Gutenberg Universität Mainz, Deutschland; 3: Goethe Universität Frankfurt, Deutschland

Resilience is the maintenance and/or quick recovery of mental health during and after periods of adversity. This definition implies that resilience is the end result of a dynamic process of successful adaptation to stressors and can no longer be understood simply as a stable, fixed personality trait or predisposition that guarantees long-term mental health. Whatever stressor the organism is exposed to, the challenge, then, is to understand the complex, interactive and time-varying processes that lead to a positive long-term outcome in the face of adversity.

For this purpose, we have designed the “Mainz Resilience Project” (MARP), conducted by Deutsches Resilienz-Zentrum (DRZ) Mainz, and the “LOngitudinal Resilience Assessment” (LORA), conducted by the DFG Collaborative Research Center CRC1193 “Neurobiology of resilience” (Mainz/Frankfurt). Both are prospective-longitudinal resilience studies with high sampling frequencies and repeated multi-modal subject characterization. Basic ideas and designs will be presented.

Psychophysiologische, neuronale und klinische Aspekte der kognitiven Emotionsregulation

Christian Paret & Carmen Morawetz

Zentralinstitut für Seelische Gesundheit, Deutschland

Raum: A 9/10


Die Beiträge geben Einblick in aktuelle Forschung zu Grundlagen- und klinischen Aspekten der kognitiven Emotionsregulation und deren physiologische Korrelate. Daraus ergeben sich wichtige Implikationen für differentielle und psychopathologische Mechanismen.”

Der Effekt von Attribution auf die Regulation von positiven und negativen Emotionen bei depressiven Patienten – eine fMRT Studie

Löfler, Leonie (1); Radke, Sina (1,2); Habel, Ute (1,2,3); Satterthwaite, Ted (4); Schneider, Frank (1,2); Denzl, Birgit (1,2,5)

1: Klinik für Psychiatrie, Psychotherapie und Psychosomatik, Medizinische Fakultät, RWTH Aachen, Deutschland; 2: JARA - BRAIN Institut I, Aachen, Deutschland; 3: Institut für Neurowissenschaften und Medizin (INM-1), Forschungszentrum Jülich, Deutschland; 4: Klinik für Psychiatrie, Perelman School of Medicine, University of Pennsylvania, Philadelphia, USA; 5: Klinik für Psychiatrie und Psychotherapie, Universitätsklinikum Tübingen, Deutschland

“Ein adäquater Umgang mit Emotionen ist fundamental für die psychische Gesundheit. Defizite in der Emotionsregulation zeigen sich beispielsweise bei depressiven Patienten (DP). Da DP dazu neigen negative Ereignisse sich selbst und positive Ereignisse äußeren Umständen zuzuordnen, stellt eine Veränderung dieses dysfunktionalen Attributionssstils eine vielversprechende Regulationsstrategie dar. In dieser fMRT-Studie wird deshalb untersucht, wie sich kausale Attribution (intern vs. extern) von positiven und negativen Ereignissen auf emotionales Erleben in DP und
gesunden Kontrollpersonen (HC) auswirken. Die Teilnehmer sollen hinsichtlich Bildern von traurigen und freudigen Gesichtern a) ihre natürliche Reaktion angeben („Betrachten“) oder sich vorstellen, die Person auf dem Bild sei eine nahestehende Person und sei traurig/freudig b) ihretwegen („interne Attribution“) oder c) weil etwas anderes geschehen ist („externe Attribution“).


Behaviorale, psychophysiologische und neuronale Korrelate der kognitiven Regulation von Stress in schizophrenen Patienten

Derrtl, Birgit (1); Schneider, Frank (2); Gur, Ruben (3); Kogler, Lydia (1)
1: Universität Tübingen, Deutschland; 2: RWTH Aachen, Deutschland; 3: University of Pennsylvania, USA


Die neuronalen Grundlagen von Emotionsregulation in Zusammenhang mit individuellen Unterschieden im Emotionsregulationserfolg

Morawetz, Carmen
Free Universität Berlin, Deutschland

Psychophysiologische Effekte expliziter Emotionsregulationsstrategien: Eine Meta-Analyse

Zähringer, Jenny; Jennen-Steinmetz, Christine; Schmahl, Christian; Paret, Christian
Zentralinstitut für Seelische Gesundheit Mannheim, Universität Heidelberg, Deutschland


Neurobiology of social behavior

Frank Krueger & Daniela Mier
Universität Mannheim, Deutschland
Raum: A 8

While the ultimate goal of social neuroscience is to investigate how the presence of others influences our thoughts, feelings and decisions, scientists are facing the challenge that most investigations rely on single subject designs. Therefore, if we want to learn what shapes not only our social perception, but also our social interactions, we need to go beyond the classical experimental paradigms. In this symposium, we present different experimental approaches — ranging from animal studies to human interactions — that capture a vast variety of biological markers shaping our social behaviors. Tobias Kalenscher (Düsseldorf) presents lesion and psychopharmacological evidence arguing for an inequality aversion in rats, which have been previously only shown in humans and non-human primates. Daniela Mier (Mannheim) demonstrates the effect of social exclusion on emotional reactivity and regulation employing psychophysiological measures (heart rate, galvanic skin response). Bernd Weber (Bonn) argues for individual differences in third-party punishment behavior based on neuroendocrine (oxytocin), functional neuroimaging, and eye-tracking evidence. Frank Krueger (Mannheim) reports a coordinate-based meta-analysis on fMRI studies of economic games that reveal a particular role of the dorsal and ventral anterior insula in social norm compliance and enforcement, respectively. Gabriela Stoessl (Mannheim) completes the symposium by demonstrating the unique and immediate synchronization of brains in love measured with fMRI hyperscanning during real interactions in couples making complements to each other. Knowing more about the neurobiology of social behaviors helps stimulating the theoretical debate and provides practical implications for improving social interactions, not only in clinical populations but also in daily life.
Psychoneuropharmacological basis of inequity aversion in rats

Schönfeld, Lisa-Maria; Schäble, Sandra; van Wingerden, Marijn; Kalenscher, Tobias

Heinrich Heine Universität Düsseldorf, Deutschland

Inequity aversion is a behavioral, motivational and emotional response to an unfair reward distribution, given equal efforts to obtain rewards. Disadvantageous inequity aversion can be caused by a reward distribution that leaves the decision-maker worse off than a partner, advantageous inequity aversion can result from a reward distribution in which the decision-maker is better off than a partner. Both types of inequity aversion have been shown in humans and non-human primates, but it remains elusive if they evolved earlier in the phylogenetic history. In my talk, I will provide evidence that rats show disadvantageous and advantageous inequity aversion. I will argue that the rats’ social preferences are the consequence of social reinforcement learning in which acoustic social signals emitted by the two interacting rats orchestrate their preferences for equal reward outcomes. I will present lesion and psychopharmacological data highlighting the importance of basolateral amygdala, and serotonin action in amygdala, in developing mutual reward preferences – the presumed motive underlying advantageous inequity aversion.

The effect of social exclusion on emotional reactivity and regulation

Mier, Daniela; Schmidt, Stephanie; Best, Eva; Fenske, Sabrina; Erkic, Maja; Kirsch, Peter
Abteilung Klinische Psychologie, Zentralinstitut für Seelische Gesundheit Mannheim, Deutschland

Social exclusion (SE) has devastating effects on emotional and cognitive processing. It results in activation in the pain matrix of the brain, reduced cognitive flexibility, less prosocial behavior and emotional numbness. Regarding autonomic response, studies are heterogeneous reporting acceleration or deceleration of heart rate and revealed no effects on skin conductance response. The present study aimed at investigating how SE influences the reaction to and regulation of emotions. We applied a newly invented SE game that combines the classical Cyberball game with a social exchange game. Rounds of the SE game were followed by emotion induction via emotional picture scenes and subsequent emotion regulation. In parallel, electrophysiological activity as well as heart rate were measured. 48 healthy participants (29 females) were included in the study. Participants completed two sessions, one with positive scenes and one with negative scenes. Participants were either in- or excluded during both sessions. SE in comparison to social inclusion participants reported a stronger effect on their own emotion by positive emotional scenes, but a weaker effect by negative emotional scenes. Regarding emotion regulation, cognitive reappraisal was effective to reduce negative and to enhance positive emotions in both groups. Preliminary analyses of electrodermal response showed no significant differences between groups. The results suggest reduced reactivity to negative emotions and increased reactivity to positive emotions after SE, along with intact emotion regulation abilities. These findings support theories proposing automatic emotion regulation after SE to mitigate its negative effects.

Individual differences in third-party punishment behavior

Weber, Bernd
Universitätsklinikum Bonn, Deutschland

Social norms are important for human societies. Norm violations (e.g. unfair transgression) are often met with punishment even by people that are not directly affected. However, punishing the offender is not the only possible option for a bystander. Driven by empathic concerns, they may also give a helping hand to the victim. In a series of studies, we investigated individual differences in altruistic behavior, the effect of attention and of the peptide oxytocine. In an fMRI study, participants voluntarily decided if they wanted to punish the first-party offender or help the second-party victim using their own monetary endowment. Before deciding, participants were instructed to focus on the (un)fairness of the offender proposing the offer, the feeling of the victim receiving this offer, or without any specific focus. We found that participants punished more frequently in the offender condition, whereas they helped more frequently in victim blocks. These findings were accompanied by an increased activation in the temporo-parietal junction. In follow-up eye-tracking study we present direct evidence that the influence of empathic concern on behavior is conveyed via attentional processes. The results show that the bystander’s decision to intervene and the respective attention distribution leading up to the choice systematically varied with the person’s level of empathic concern. In a third study, we focus on the effect of oxytocine on altruistic behavior. Our findings indicate that oxytocine enhances prosocial-relevant perception by increasing theory-of-mind related neural activation. We discuss the theoretical and practical implications of our results.
The role of the anterior insula in social norm compliance and enforcement: a coordinate-based meta-analysis
Bellucci, Gabriele (1); Feng, Chunliang (2); Eickhoff, Simon B (3); Krueger, Frank (4)
1: Universität zu Lübeck, Deutschland; 2: Beijing Normal Universität, China; 3: Heinrich-Heine University Düsseldorf, Deutschland; 4: Universität Mannheim, Deutschland
Social norm behaviors can be reliably measured with economic games: trust game (TG: reciprocity) and ultimatum game (UG: fairness). Previous neuroimaging evidence has highlighted the role of the anterior insula (AI) in behaviors for social norm compliance and enforcement. However, it remains elusive whether sub-regions of AI represent higher-order cognitive and affective processes particularly related to expectations of norm compliance and inequality aversion motivating norm enforcement. We hypothesized that dorsal AI (dAI) is associated with expectations of social norm compliance and ventral AI (vAI) with inequality aversion for social norm enforcement. We conducted a comparative coordinate-based meta-analysis (activation likelihood estimation) on fMRI studies of economic games (TG, UG) and performed task-based meta-analytic connectivity mapping (MACM) and task-free resting-state functional connectivity (RSFC) analyses to investigate separate AI functions associated with social norm compliance and enforcement. Our results showed that right dAI and vAI were the only consistently common activated brain regions across economic games and both regions were part of two functionally distinguishable connectivity networks as revealed by our MACM and RSFC analyses. We propose that dAI probably signals monitoring processes in response to forward-looking (uncertainty) and backward-looking (sensitivity) expectancy of social norm compliance; whereas the vAI, aversive feelings in response to advantageous (guilt) and disadvantageous (anger) inequality aversion motivating norm enforcement. Our meta-analysis results represent a step forward towards a better characterization of the role of the right AI in social norm compliance and enforcement, which could help to characterize impairment and intervention for different clinical populations in the future.

Brains in love: An fMRI hyperscanning study
Stössel, Gabriela (1); Bilek, Edda (1); Eckstein, Monika (2); Gerchen, Martin F (1); Ditzen, Beate (2); Kirsch, Peter (1)
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Love is probably the most fascinating feeling that a person ever experiences. However, only little is known about what is happening in the brains when two individuals being in love interact with each other. Previous neurophysiological studies were restricted to showing pictures of beloved. To get a deeper inside into loving brains in nearly naturalistic situation, we scanned both heterosexual partners in identical and synchronized MRI scanners while they sent compliments to each other and stayed in visual touch via video. This allowed simultaneous view of the functional processes of human brains engaged in a real romantic interaction. Each of 54 participants chose and sent 15 compliments to her/his partner. The compliments had been written down and kept secret prior to the scanning session. Data were analyzed with functional connectivity and psychophysiological interaction methodology using multiple seeds, comprising regions associated with social cognition (posterior superior temporal gyrus) and affective functions (amygdala, anterior insular cortex). To assure that our results were unique for real pairs, we performed randomization tests. Functional connectivity analysis revealed a covariation of the social brains during the task completion. There was no observable delay between the partners, as shown in the cross-correlation analysis. The randomization tests confirmed the unique character of the covariation for real couples. Psychophysiological interaction analysis showed significantly stronger synchronization between partners’ anterior insulas when the compliments were presented than during the waiting phase. We demonstrated that during real interaction of brains being in love, social brain regions are uniquely and immediately synchronized.

Oxytocin moduliert den Blickfokus bei
bindungsrelevanten Stimuli.

Eckstein, Monika (1); Bamert, Vera (2); Ehlert, Ulrike (2); Ditzen, Beate (1)
1: Universitätsklinikum Heidelberg, Deutschland; 2: Universität Zürich


Der Einfluss von Oxytocin auf
elektrophysiologische Korrelate der
Fehlerverarbeitung

Radke, Sina (1); Ruissen, Margit (2); de Bruijn, Ellen (2)
1: Uniklinik RWTH Aachen, Deutschland; 2: Leiden University, Niederlande

Im Alltag haben Fehler oftmals nicht nur Konsequenzen für uns selbst, sondern auch für andere Personen. Studien mittels Elektroenzephalographie (EEG) deuten darauf hin,

Oxytocin normalisiert soziales Lernen und Annäherungs- und Vermeidungsverhalten bei sozial hoch ängstlichen Männern und Frauen

Bertsch, Katja (1); Volman, Inge (2); Bühlau, Konstantin (1); Herpertz, Sabine (1); Müller, Laura (1)
1: Universität Heidelberg, Deutschland; 2: UCL Institute of Neurology, London, United Kingdom


Virtually Anxious: Oxytocin, Soziale Phobie und zwischenmenschlicher Abstand

Lange, Wolf-Gero (1); Becker, Eni S. (1); Roelofs, Karin (1); Heinrichs, Markus (2)
1: Radboud University Nijmegen, The Netherlands, Niederlande; 2: Dept. Biologische und Differentielle Psychologie, Albert-Ludwigs-University, Freiburg

Transcranial brain stimulation to study the function of neuronal oscillations

Bergmann, Til Ole
Universität Tübingen, Deutschland

Neuronal oscillations are a ubiquitous feature of brain activity, observed across species, neuronal structures, and behavioral states. They are believed to rhythmically organize neural activity across multiple temporal and spatial scales, orchestrate local information processing and communication between brain structures, and thus provide the basis for plethora of cognitive functions. Electro- and magnetoencephalography (EEG/MEG) serve well to non-invasively study neuronal oscillations in humans, but the obtained information is of correlative nature. Direct manipulation of neural activity is required to reveal the causal contribution of neuronal oscillations to cognition. Transcranial magnetic stimulation (TMS) and transcranial current stimulation (TCS) can be combined with EEG and MEG, either concurrently (online) or consecutively (offline), to non-invasively manipulate and measure neuronal oscillations in the human brain. Online approaches, assessing the immediate neural response to stimulation, can be used to (i) quantify neuronal network properties such as excitation, inhibition, or connectivity in a phase and amplitude specific manner, (ii) interfere with ongoing spontaneous or task-related oscillatory activity, or (iii) modulate the level and timing of neuronal oscillations. In contrast, offline approaches can be utilized to either (iv) inhibit or (v) facilitate local neuronal excitability via the induction of synaptic plasticity, assessing its subsequent effects on neuronal oscillations. I will introduce different experimental approaches and illustrate them by concrete examples of my own research. I will also introduce the idea of brain state-dependent brain stimulation, which allows to trigger TMS/TCS in realtime, targeting specific oscillatory states to study their role in information processing and synaptic plasticity.

On- and offline effects of tACS on spontaneous and event-related oscillations

Herrmann, Christoph; Kasten, Florian
Department of Psychology, European Medical School, Carl von Ossietzky University Oldenburg

Neuronal oscillations have been linked to a variety of cognitive functions, behaviors and perception. Likewise, dysfunctional oscillatory activity is implicated in many pathological mental states. Traditionally, these relationships have been investigated using correlational neuroimaging approaches such as Magneto- or Electroencephalography (MEG/EEG) or invasive recordings. In recent years,
transcranial alternating current stimulation (tACS) has revealed as a powerful tool to non-invasively interfere with endogenous brain oscillations. By applying weak oscillatory currents through the scalp, it is capable to entrain neural oscillations, allowing to directly study causal relationships between different oscillatory components like frequency, phase or amplitude and cognition, perception or behavior. In contrast to other approaches such as repetitive transcranial magnetic stimulation (rTMS), tACS offers high control over waveform parameters (shape, frequency, phase, amplitude) and can be applied below participants’ sensation threshold allowing for better sham control and higher comfort during experimentation. However, so far both on- and offline effects of tACS are poorly described and understood. We will present recent data from our group characterizing the outlasting effects of tACS on spontaneous alpha oscillations during resting state and on event-related oscillatory activity during the performance of more complex cognitive tasks in the EEG. Furthermore, we will show how the induced changes on the physiological level relate to changes in cognitive task performance. Finally, we will show how concurrent MEG and tACS can be used to unveil online effects of the stimulation on event-related oscillatory dynamics during task execution.

TDCS-induced modulation of associative learning and functional connectivity in older adults

Antonenko, Daria
Department of Neurology, NeuroCure Clinical Research Center, Charité Universitätsmedizin, Berlin

Strategies of cognitive enhancement, in particular for older adults, are of great scientific and public interest. Especially the concurrent application of non-invasive transcranial brain stimulation, such as transcranial direct current stimulation (TDCS), together with cognitive task performance has been suggested as promising means to enhance the function under study with the potential to even produce long-term transfer effects. However, studies of both, behavioral and neurophysiological TDCS-induced effects in older adults are scarce and findings are heterogeneous, possibly due to the inter-individual variability in TDCS-responsiveness and age-dependency of the effects. Here, I will introduce this topic, providing evidence for age-associated variability in TDCS-effects on functional connectivity. I will show recent data from our group, exploring the TDCS-induced augmentation of associative learning and episodic memory processes in older adults and functional network effects as assessed by resting-state functional magnetic resonance imaging that are associated with this augmentation. I will discuss that detailed neurophysiological and behavioral studies in the older population are important to increase our understanding of age-related brain plasticity and connectivity alterations, as this is the age group in which we most hope to see effects.

Rapid short-term reorganization in the healthy and lesioned language network - evidence from TMS & functional neuroimaging

Hartwigsen, Gesa
MPI Leipzig, Deutschland

Language is the elementary mental capability that humans use to communicate. I will demonstrate how multimodal combinations of transcranial magnetic stimulation (TMS) and functional neuroimaging or electrophysiological measures can be used to characterize interactions, adaptive plasticity and effective connectivity in the language network. The first part of my talk focuses on the use of TMS during a language task to elucidate the causal contribution of a given area to a specific language function and the interaction of different regions during a task. I will also provide first evidence from simultaneous TMS-EEG that TMS can affect electrophysiological components of specific language functions. The second part of my talk is related to the combination of plasticity-inducing TMS before a task and subsequent functional neuroimaging to shed light on adaptive short-term plasticity during language processing. I will show that a TMS-induced perturbation might suppress task-related activity not only in the stimulated area, but in a large task-specific language network. Moreover, TMS can also modulate task-specific effective connectivity within this network. I will discuss how the upregulation of neighboring regions after a TMS-induced perturbation of a key language region can contribute to a better understanding of short-term reorganization and plasticity in the healthy language network. Finally, I will present novel TMS-fMRI data on the investigation of adaptive plasticity in the reorganized language network in patients with chronic post-stroke aphasia. These data show that the lesioned language network has an increased sensitivity to the TMS-induced perturbation effect.
**SYMPOSIEN DONNERSTAG**

16:00-17:30

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**Oxytocin und menschliches Verhalten: Soziale, psychomotorische und neuronale Mechanismen**

Markus Heinrichs & Gregor Domes

Raum: HS 1

Oxytocin und menschliches Verhalten: Soziale, psychomotorische und neuronale Mechanismen

Heinrichs, Markus

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Für eine translationale Perspektive hinsichtlich einer klinischen Relevanz von Oxytocin bei der Therapie psychischer Störungen mit sozialen Defiziten sind weitere experimentelle Studien erforderlich, um die psychobiologischen Prozesse zu verstehen.

Oxytocin moduliert psychomotorische Funktionen unter Alkoholeinfluss. Erste Ergebnisse einer Pilotstudie

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"Es konnte kürzlich tierexperimentell gezeigt werden, dass Oxytocin (OT) neben seinen wohlbekannten Effekten auf soziale und emotionale Prozesse auch in der Lage ist, alkoholbedingte motorische Störungen zu reduzieren. Die vorliegende Studie wurde durchgeführt, um zu überprüfen, ob sich dieser Effekt auch bei Menschen zeigen lässt. 15 gesunde Probanden erhielten in einer doppeblindenden cross-over Studie intranasal entweder 24 IU OT oder ein Placebo. Danach konsumierten die Probanden Alkohol bis zu einem Atemalkoholwert von ca. 0,6 %. 45 Minuten nach OT-Gabe bearbeiteten die Probanden eine Testbatterie mit lokomotorischen und visuomotorischen Aufgaben. Die Testbatterie bestand aus Fingertapping-Aufgaben unterschiedlicher Frequenz (2 und 3 Hz), die entweder getaktet oder frei ausgeführt werden musste, einer visuo-spatiaalen Pointing-Aufgabe zur Erfassung der Auge-Hand-Koordination und verschiedenen Eye-Tracking-Paradigmen (Pro- und Anti-Sakkaden und glatte Augenfolgebewegungen).

Erste Analysen zeigen eine tendenziell bessere Präzision (geringe Standardabweichung) beim Tapping bei 2 Hz, eine kürzere sensorische Reaktionszeit bei der Pointing-Aufgabe und eine schnellere Augenbewegung bei Prosakkaden unter OT.

Die Ergebnisse sprechen für eine Verbesserung Alkoholbedingter psychomotorischer Einschränkungen durch die Gabe von OT. Dabei scheinen sich die Effekte in erster Linie auf automatische motorische Prozesse zu beschränken. Derzeit steht aber noch die Einbeziehung einer Kontrollgruppe ohne Alkoholeinfluss aus, um das Ausmaß der psychomotorischen Störungen durch Alkohol als auch Alkohol-unabhängige Effekte des OT auf die Psychomotorik zu prüfen. Die Ergebnisse werden im Vortrag präsentiert."

Dosis- und latenzabhängige Modulation der Amygdalaaktivierung durch intranasales Oxytocin

Effekte von Oxytocin auf das Neidverhalten gegen Out-Groups in realen Intergruppenkonflikten

Schiller, Bastian (1); Domes, Gregor (1,2); Heinrichs, Markus (1)
1: Universität Freiburg, Deutschland; 2: Universität Trier, Deutschland

Effekte von Oxytocin auf mimische Imitation und soziale Aufmerksamkeit bei Autismus

Domes, Gregor (1); Kanat, Manuela (2); Spenthof, Ines (1); Heinrichs, Markus (2)
1: Universität Trier, Deutschland; 2: Universität Freiburg, Deutschland

"Menschen mit Autismus Spektrum Störungen (ASD) zeigen eine geringere Aufmerksamkeit, eine geringere Tendenz zur mimischen Imitation, und geringere Emotionserkennung für Gesichter. Oxytocin beeinflusst die Verarbeitung von sozialen Reizen und fördert z.B. die Emotionserkennung. In mehreren Experimenten untersuchten wir die Effekte einer intranasalen Oxytocingabe auf die Aufmerksamkeit für Gesichter, mimische Imitation und Emotionserkennung bei Männern mit ASD.


Der Einfluss von frühkindlicher Belastung auf die Stresswahrnehmung im zentralen Nervensystem - eine fMRT Studie

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Wichtige Fragen sind dabei aber ungeklärt, z.B. ob frühkindliche Belastung zu einer Erhöhung oder Erniedrigung der Stressantwort führt, und wie sie sich auf die Stressverarbeitung im zentralen Nervensystem auswirkt. Um diesen Fragen nachzugehen, haben wir insgesamt 80 junge Männer (18-30 Jahre) mit und ohne frühkindliche Belastung (je n=40) mit dem Montreal Imaging Stress Task (Siemens 3T) untersucht. Dabei wurde die endokrine Stressreaktion mit Hilfe von Speichelproben, und die Stresswahrnehmung durch Fragebögen erfasst. Zusätzlich zur frühkindlichen Belastung wurde ein weiterer situativer Faktor (Todesgedanken) manipuliert, so dass vier Experimentgruppen entstanden (je n=20).

Beide Faktoren zeigten dabei signifikante Effekte - sowohl auf die Cortisolstressreaktion, als auch auf Aktivitätsveränderungen im ZNS. Die ZNS-Effekte können sowohl mit unterschiedlicher Cortisolreaktivität, als auch mit der frühhkindlichen Belastung per se zusammenhängen. Es zeigen sich weiterhin strukturelle Unterschiede zwischen den Personen mit und ohne frühkindliche Belastung, was auf Entwicklungsstadien hinweist. Beim Vortrag werden die unterschiedlichen Interpretationsmöglichkeiten dieser Ergebnisse diskutiert, und in die bestehende Literatur zur frühkindlichen Belastung eingeordnet."
Effekte von Hydrocortison auf den Gedächtnisabruf und deren neuronale Korrelate bei Patienten mit Borderline-Persönlichkeitsstörung

Metz, Sophie; Fleischer, Juliane; Otte, Christian; Wingenfeld, Katja
Charité - Universitätsmedizin Berlin, Deutschland


Neuronale Korrelate der Cortisol-induzierten Rückkehr konditionierter Furcht

Kinner, Valerie L.; Wolf, Oliver T.; Merz, Christian J. Ruhr-Universität Bochum, Deutschland


Sport als Stresspuffer: Biologische Mechanismen und Moderatoren

Jana Strahler & Dirk Moser
Justus-Liebig-Universität Giessen, Deutschland
Raum: A 8

“Physische und psychosoziale Belastungssituationen führen zu einer Kaskade an Reaktionen, die den Organismus bestmöglich an potentielle und tatsächliche Bedrohungen anpassen sollen. Während sportlicher Belastung eine stresspuffernde Wirkung zugeschrieben wird, kann chronischer (unkontrollierbarer) psychosozialer Stress langfristig zu Fehlregulationen der beteiligten Systeme führen und dadurch Krankheitsprozesse begünstigen. Im Rahmen dieses interdisziplinären Symposiums wollen wir anhand verschiedener Forschungsansätze aufzeigen, über welche Mechanismen Sport gesundheitsförderlich wirkt. Dabei werden wir Sport als therapeutische und arbeitsmedizinische Intervention, als Stresspuffer, aber auch als chronischen Stressor kritisch reflektieren und in seinen...
Folgen/Potentialen gegenüber psychosozialem Stress abgrenzen.

Die erste Präsentation beschäftigt sich mit der Freisetzung zellfreier DNA nach körperlicher und psychosozialer Belastung. Es zeigte sich nach beiden Belastungssituationen eine signifikante Erhöhung an zellfreier DNA und Stresshormonen. Angst, sowie negative selbstbezogene Emotionen traten verstärkt nach psychosozialem Stress auf.

Die zweite Präsentation zeigt die immunologischen Effekte einer Kognitiven Verhaltenstherapie mit Bewegungsaufbau bei Patienten mit Depression (im Vergleich zu einer aktiven und passiven Kontrollgruppe). Hierbei sehen wir einen Anstieg anti-inflammatorischer Prozesse in der Bewegungsgruppe sowie eine Reduktion des pro-inflammatorischen Geschehens in einer Subgruppe mit erhöhtem kardiovaskulären Risiko (C-reaktives Protein > 1.0 mg/l).

Die dritte Präsentation wirft einen kritischen Blick auf Sport als Stressor aus Sicht der Sportwissenschaften. Darüber hinaus werden die psychischen und biologischen Effekte eines High-Intensity-Interval-Trainings im Arbeitskontext vorgestellt.


Freisetzung zellfreier DNA unter psychosozialen und körperlichen Belastungsbedingungen

Hummel, Elisabeth; Kumsta, Robert; Moser, Dirk
Ruhr-Universität-Bochum, Deutschland


Immunologische Effekte von kognitiver Verhaltenstherapie mit Bewegungsaufbau bei Major Depression; Ergebnisse einer explorativen randomisierten-kontrollierten Studie

Euteneuer, Frank (1); Dannehl, Katharina (1); Schedlowski, Manfred (2); Rief, Winfried (1)
1: Universität Marburg, Deutschland; 2: Universitätsklinikum Essen, Deutschland

Stressmessung im Sport aus Sicht der Sportwissenschaften

Zinner, Christoph
Institut für Sportwissenschaft, Julius-Maximilians-Universität Würzburg, Deutschland


Einfluss von Sport, Coping und Wettbewerbsdenken auf die psychobiologische Stressreaktion

Strahler, Jana (1); Nater, Urs M. (2); Haussmann, Alexander (3)
1: Justus-Liebig-Universität Giessen, Deutschland; 2: Philipps-Universität Marburg, Deutschland; 3: Deutsches Krebsforschungszentrum Heidelberg, Deutschland


Während sich die Annahmen der Cross-Stressor-Adaptation nur ansatzweise nachweisen ließen, bieten die Befunde zu den moderierenden Effekten proaktiven Copings, Wettbewerbsdenkens und Wettkampferfahrung...
The detrimental effects of stress hormones on cognitive processes and their potential benefit as a cognitive enhancer of psychotherapy: experimental studies in patients and healthy controls

Johanna Lass-Hennemann & Linn Kühl
Universität des Saarlandes, Deutschland
Raum: A 8

It is well established that stress hormones influence cognitive processes. On the one hand, psychological disorders are often characterized by dysregulations in somatic stress systems and these dysregulations are thought to be linked to dysregulated cognitive processes in several psychological disorders. On the other hand, hormonal neuroenhancers (that are part of or related to the human stress response) have been proposed to improve therapy outcome. This symposium will focus on both sides of the coin: (1) the maladaptive dysregulations of somatic stress systems and how these are related to symptomatology, (2) the potential of exogenous administration of hormones to enhance treatment outcomes. First, Linn Kühl (Charité Berlin) will present a study on the effects of psychosocial stress on cognition in patients with Major Depression (MDD) with and without adverse childhood experiences. Second, Christian Deuter (Charité Berlin) will present an experimental study in MDD patients investigating cognitive effects of enhanced noradrenergic activity by yohimbine administration linking maladaptive changes in the locus coeruleus-noradrenergic system to cognitive symptoms. In the third talk, Johanna Lass-Hennemann (Saarland University) will present data on effects of cortisol on extinction learning in a fear-conditioning paradigm with aversive film clips (as an experimental analogue to trauma exposure). In the fourth talk, Leila Soravia will present data on the effects of cortisol administration on craving in patients with alcohol abuse disorder. Finally, Diana Ferreira de Sa (Saarland University) will present a study on the effects of insulin on extinction learning in a fear-conditioning paradigm.

Stress effects on cognitive performance in patients with major depressive disorder

Kühl, Linn (1); Spitzer, Carsten (2); Otte, Christian (1); Wingenfeld, Katja (1)
1: Charité Universitätsmedizin Berlin, Deutschland; 2: Asklepios Fachklinikum Tiefenbrunn, Rosdorf, Deutschland

Impairments in cognitive functions and in the somatic stress systems, e.g., increased cortisol secretion, have been demonstrated in major depressive disorder (MDD). Adverse childhood experiences (ACE) increase the risk to develop major depressive disorder (MDD) and may also contribute to maladaptive changes in the somatic stress systems. Several studies have shown that stress or cortisol can affect cognitive performance. Our study aimed to investigate effects of a psychosocial stressor on cognitive performance in MDD patients. Additionally, we aimed to further disentangle the potentially mediating role of ACE. 32 women with MDD and ACE (as determined by a clinical interview (Early Trauma Inventory)), 52 women with MDD without ACE, 22 women with ACE but no current or lifetime MDD and 37 healthy women without either MDD or ACE participated in the study. The four groups did not differ in demographic variables. All participants underwent a psychosocial stress test (Trier Social Stress Test, TSST) and a control condition (Placebo-TSST) before we measured psychomotoric speed, executive function, working memory, verbal learning and memory using established neuropsychological testing. The results show significant effects of group (p< .05) with rather impairing effects of stress in MDD. Stress resulted in higher cortisol release and higher blood pressure compared to the control condition. Our study indicates specific effects of stress on cognition in MDD patients.

Cognitive effects of increased noradrenergic activity by yohimbine in patients with major depression

Deuter, Christian Eric; Wingenfeld, Katja; Otte, Christian; Kühl, Linn
Charité Universitätsmedizin Berlin

Stress has been shown to play a fundamental role in the development and maintenance of major depression. Importantly, maladaptive changes in the physiological stress regulation systems have been demonstrated. For instance, in the locus coeruleus-noradrenergic (LC-NA) system, an up-regulation of central alpha2-adrenergic receptors has been found. Chronic stress in early life, e.g., adverse childhood experiences (ACE) such as physical or sexual abuse, is one hypothesized mechanism. The LC-NA
system influences not only the physiological stress response, but also affects cognitive function. Although cognitive deficits are core symptoms of a major depressive disorder (MDD), the relationship of the LC-NA system and cognitive processes has rarely been investigated so far in depressed patients. Therefore, this study aims to investigate whether noradrenergic stimulation affects cognitive flexibility in MDD patients. Additionally, we aim to further disentangle the potentially mediating role of adverse childhood experiences. In a double blind design, 20 MDD patients with ACE, 20 MDD patients without ACE, 20 healthy participants with ACE and 20 healthy control participants without ACE are tested after administration of 10 mg yohimbine. Task performance serves as the independent variable. Results of this study will be presented at the conference. The results of this study will contribute to a better understanding of the role of the LC-NA system - and potential consequences due to dysfunctional changes as a result of intense stress experiences - as an underlying neurobiological mechanism of cognitive processes in patients with major depressive disorder.

The influence of cortisol on memory consolidation in a novel fear conditioning paradigm with aversive film clips

Lass-Hennemann, Johanna; Gräbener, Alexandra; Michael, Tanja
Universität des Saarlandes, Deutschland

“Background: Cortisol has been proposed as a pharmacological booster of exposure therapy. Fear extinction is considered to represent an important memory mechanism in exposure therapy for anxiety disorders and posttraumatic stress disorder (PTSD). Therefore, the possible enhancing effect of cortisol administration on fear extinction may have high therapeutic relevance. However, in previous fear conditioning studies the stimuli were rather low in ecological validity for anxiety disorders such as PTSD. By using aversive film clips as unconditioned stimuli, the present study aimed to investigate the influence of cortisol on fear extinction in a more naturalistic fear conditioning paradigm. Methods: In a randomized double-blind placebo-controlled design, 60 participants were exposed to a fear conditioning paradigm with traumatic film clips as unconditioned stimuli (US) with fear acquisition on day 1, fear extinction on day 2 and test of reinstatement on day 3. Participants received either a dose of cortisol (30mg) or placebo immediately after the extinction trials. We assessed US expectancy ratings, physiological fear responses and intrusive memories of the traumatic film clips. Results: The fear reinstatement manipulation led to lower levels of fear in the cortisol group than in the placebo group indicating a more solid extinction learning in the cortisol group. Physiological data are currently analyzed and will be presented at the conference. Conclusion: Our results emphasize the role of cortisol on memory consolidation in fear extinction and support the idea that cortisol might be a useful treatment adjunct for PTSD.”

Acute effects of cortisol on alcohol craving in alcohol use disorder

Soravia, Leila Maria (1,2); de Quervain, Dominique J.-F. (3)
1: University Hospital of Psychiatry, University of Bern, Switzerland; 2: Suedhang Clinic, Kirchlindach, Switzerland; 3: Division of Cognitive Neuroscience University of Basel, Birmannsgasse 8, 4055 Basel, Switzerland

Background: Alcohol use disorder (AUD) is a severe and chronically relapsing disorder. Stress is known to increase craving and alcohol-taking behavior, but it is not known whether the stress hormone cortisol mediates these stress effects or whether cortisol may rather reduce craving, for example, by inhibiting the retrieval of addiction memory. The aim of the present study was to investigate the effects of cortisol administration on craving in abstinent patients with AUD during an abstinent-oriented inpatient treatment. Methods: In this randomized, double-blind, placebo-controlled, cross-over design 46 abstinent patients with AUD were tested with two exposure sessions within two weeks. Cortisol (20 mg) or placebo was orally administered 1 hour before each exposure session. Psychological (craving, stress) and physiological (cortisol, heart rate) parameters were repeatedly measured during both test-days. Results: Independent of cortisol, repeated in-vivo exposure to alcohol resulted in reduced craving. Thus, acute cortisol administration did not significantly reduce craving during the in-vivo exposure to alcohol. However, patients receiving cortisol at the first experimental day showed significantly reduced craving at the second experimental day one week later compared to the patients who received first placebo and then cortisol. Conclusion: These findings are in line with previous studies in patients with anxiety disorders indicating that adding cortisol to in-vivo exposure enhances the consolidation of the habituation effect and therefore might enhance treatment outcome.
Effects of intranasal insulin application on conditioned fear extinction in healthy humans

Ferreira de Sá, Diana S.; Michael, Tanja
Division of Clinical Psychology and Psychotherapy, Department of Psychology, Saarland University, Saarbrucken, Germany

“Fear conditioning and fear extinction are important learning models that allow the study of the etiology and treatment of anxiety disorders. Impairments in fear extinction are commonly found in patients with anxiety disorders, which can be reflected in difficulties during exposure therapy. In the last years, cognitive enhancers have received increased interest as potential co-adjuvants of therapy. Previous research has shown that central insulin has an enhancing effect on certain memory and learning tasks. Additionally, insulin plays a role in the stress response, and has been suggested as a potential treatment agent for PTSD. However, the effects of intranasal insulin on fear conditioning processes have yet to be studied.

The present study aimed to investigate the effect of acute intranasal insulin on fear extinction in healthy men and women. For this purpose we used a differential fear conditioning procedure with human face pictures as stimuli. In a between-subjects balanced fashion one of the face pictures (CS+) was reinforced by an electrical shock (UCS), while the remaining one served as unreinforced neutral stimuli (CS-). The conditioning procedure was divided in 3 different phases: fear acquisition (day 1), extinction (day 2), reinstatement (day 3). On day 2, a single dose of intranasal insulin (160 IU) or corresponding placebo was applied 45 minutes before fear extinction.

Preliminary data shows a sex-specific effect of condition (insulin vs. placebo) on fear extinction on the level of US-expectancy ratings and electrodermal responses. We will also present startle reflex potentiation data and results from the reinstatement phase.”

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SYMPOSIEN FREITAG
08:30-10:00

Stress × gene interactions in health and disease

Lars Schwabe
Universität Hamburg, Deutschland
Raum: HS 1

Stress is ubiquitous in our daily life and may have a crucial impact on our health and well-being. These effects of stress are critically mediated by hormones and neurotransmitters that are released in response to stressful encounters, such as glucocorticoids and catecholamines. Through the action of these stress mediators on brain structures implicated in emotion and cognition, stress may alter affective and cognitive processes and these changes may ultimately contribute to psychopathology. However, not all individuals are equally susceptible to the impact of stress on cognition, emotion, and mental health. In addition to social and developmental factors, genetic variations are a likely source of such individual differences in stress sensitivity. This symposium will focus on the role of genetic variations of the glucocorticoid system in stress-induced changes in cognition in healthy individuals as well as in the risk for psychopathology after trauma exposure. Further, this symposium will address the predictive value of the genetic background for the development of stress-related mental disorders. Together, this symposium will provide novel insights into the genetic basis of individual differences in the vulnerability to detrimental consequences of stressful events.

A haplotype of the mineralocorticoid receptor system promotes the stress-induced shift toward procedural learning

Wirz, Lisa (1); Reuter, Martin (2); Wacker, Jan (1); Felten, Andrea (2); Schwabe, Lars (1)
1: Universität Hamburg, Deutschland; 2: Universität Bonn, Deutschland

Stress modulates the engagement of multiple memory systems in a manner that favors dorsal striatum-dependent procedural over hippocampus-dependent declarative memory. Not all individuals are equally susceptible to this stress-induced shift, yet the source of these individual differences is largely unknown. Pharmacological studies suggest that the mineralocorticoid receptor (MR) is critically involved in the stress-induced bias toward striatal learning. Thus, we hypothesized that genetic variants of the MR gene (NR3C2) contribute to individual differences in the effects of stress on multiple memory systems. In two independent studies, healthy participants were genotyped, underwent a stress or control manipulation and performed a probabilistic classification task that can be supported by both the hippocampus and the striatum while EEG (study I) or fMRI (study II) measurements were taken. Stress led to a shift from hippocampal to striatal learning strategies and this shift was more pronounced in carriers of a 6 SNPs comprising haplotype containing variants associated with increased MR expression ([rs2070951] MR-2G/C, [rs5522] MR-180V A). Our EEG and fMRI data suggest that carriers of this haplotype show diminished engage-
ment of the hippocampus, thereby facilitating the stress-induced shift toward striatal learning. Furthermore, coupling between hippocampus, dorsal striatum, and amygdala was modulated by stress and the MR haplotype. Our findings show that genetic variants associated with enhanced MR expression facilitate a stress-induced shift from hippocampal toward dorsal striatal learning, which might represent an efficient mechanism for coping with stress and hence enhance resilience toward stress-related psychopathologies.

Stress-induced epigenetic modification of the glucocorticoid receptor gene and its consequences for emotional memory function and PTSD risk

Vukoevíc, Vanja; de Quervain, Dominique J.–F. Transfaculty Research Platform Molecular and Cognitive Neurosciences, University of Basel, Switzerland

Timed activation of glucocorticoid receptors (GRs) is important for memory consolidation, especially of emotionally arousing information. Furthermore, there is evidence that glucocorticoids impair memory retrieval. Because fear learning and memory processes play an important role in the pathogenesis of PTSD, GRs have been implicated in PTSD risk. Epigenetic mechanisms may contribute to inter-individual differences in GR signaling. In particular, it has been shown that perinatal stress can alter DNA methylation of the GR gene promoter. We will discuss the consequences of epigenetic modifications of the GR gene and other glucocorticoid-related genes for emotional memory functions and the risk for PTSD.

Plieger, Thomas; Felten, Andrea; Splittgerber, Hanna; Reuter, Martin
Uni Bonn, Deutschland

"Although HPA – axis reactivity has repeatedly been related to cognitive functioning, there is ambiguity regarding the direction of the effect. Genetic factors contribute to the HPA – axis reactivity on the one hand and to cognitive functioning on the other hand and could, therefore, help understanding the association between stress and cognition.

We genotyped 10 single nucleotide polymorphisms (SNPs) on the NR3C1 gene (rs10482682, rs33389, rs10482633, rs10515522, rs41423247, rs6189, rs10052957) coding for the glucocorticoid receptor (GR) and 4 SNPs on the NR3C2 gene (rs810951, rs4635799, rs11099695, rs2070950) coding for the mineralocorticoid receptor (MR) and let N=127 healthy males perform an attentional and a reasoning task (Socially Evaluated Cold Pressor Test, SECPT).

We performed haplotype analyses and found significant effects of NR3C1 (p = .009) and NR3C2 (p = .034) on cortisol response following the stressor. NR3C2 also influenced attentional performance via an interaction with stress-induced cortisol response (p < .001). Neither NR3C1 haplotype nor NR3C2 haplotype was associated to reasoning abilities.

Results suggest that the association between cortisol and cognition strongly depends on genetic variation. The idea of an optimal arousal level depending on the stressor or stress reactivity and genetic disposition is discussed."

The interaction between genetic vulnerability and deployment-related trauma on the development of posttraumatic stress disorder and depression

Schür, Remmelt Rudolf (1); Schijven, Dick (1); Boks, Marco (1); Rutten, Bart (2); Stein, Murray (3); Veldink, Jan (1); Joëls, Marian (1,4); Kahn, René (1,5); Geuze, Elbert (1,6); Vermetten, Eric (6,7); Luykx, Jurjen (1,8); Vinkers, Christiaan (1)

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"Background. Genetic vulnerability and exposure to stress are the main components that determine whether an individual develops a psychiatric disorder, such as posttraumatic stress disorder (PTSD) or major depressive disorder (MDD). Genome-wide association studies (GWASs) are starting to uncover the genetic background underlying these moderately heritable disorders. However, it is currently unknown to what extent genetic vulnerability and trauma exposure interact in the development of PTSD and MDD.

Methods. We investigated whether genetic risk based on summary statistics of the largest GWASs for PTSD and MDD to date predisposed individuals to develop these disorders in a prospective military cohort (N = 516) at five time points after deployment to Afghanistan: one month, six months and one, two and five years. Linear regression was used to analyze the contribution of polygenic risk scores (at multiple p-value thresholds of association) and
their interaction with deployment-related trauma to the development of PTSD and depressive symptoms.

Results. We found no main effects of polygenic risk scores nor evidence for interaction with trauma on the development of PTSD or depressive symptoms at any of the available time points in the five years after military deployment.

Conclusions. Our results based on a unique long-term follow-up of a deployed military cohort suggest limited validity of current PTSD and MDD polygenic risk scores. Even though PTSD GWASs will likely benefit from larger sample sizes, progress probably depends on phenotype refinement that reduces etiological heterogeneity.

The functional organization of visual working memory: New evidence by EEG and MEG approaches

Daniel Schneider
Leibniz-Institut für Arbeitsforschung an der TU Dortmund, Deutschland
Raum: A 9/10

Working memory is a central component of cognitive processing as it entails a set of functions enabling the temporary storage and manipulation of information. Event-related EEG and MEG data provide useful tools for investigating the functional organization of working memory, as they are based on high-frequency recordings of neural activity and thus allow for studying to what extent working memory representations are dynamic and change over time. This symposium highlights four approaches to the study of neural representations of working memory: First, Benjamin Peters will present a new whole-report approach for studying the load-dependent precision of working memory representations, supported by cognitive modelling and MEG data. Second, Daniel Schneider will present recent work on the neural processes underlying the retroactive focusing of attention within visuo-spatial working memory representations by means of both event-related potentials (ERPs) and oscillatory parameters of the EEG. Third, Thomas Töllner will focus on ERP evidence from retroactive cuing paradigms and an enumeration task, indicating a dimension-based level of working memory representations. Finally, Edmund Wascher will present a new experimental approach for separating stimulus- and response-related stages of working memory processing by means of ERPs and oscillatory EEG parameters. The overarching goal of this symposium thus is to provide an overview of recent EEG/MEG research in the field of working memory and thereby advance the current view on the neural code of this fundamental mechanism.

A whole-report approach improves assessment of item precision in visual working memory

Peters, Benjamin (1); Rahm, Benjamin (2); Kaiser, Jochen (1); Bledowski, Christoph (1)
1: Goethe-Universität Frankfurt am Main, Deutschland, 2: 2Medical Psychology and Medical Sociology, Alberts-Ludwigs-University, Freiburg, Germany

The capacity of visual working memory (vWM) is highly limited. Increasing the number of items that have to be stored decreases their average mnemonic precision. The nature of vWM precision and its neuronal origins remain highly debated. The neuronal correlates of vWM precision are typically assessed by asking participants to reproduce only one out of several items held in vWM and relating this response to concurrently measured brain activity. The efficacy of this approach, however, is strongly limited because, first, the report of a single item provides only a very noisy estimate of the underlying mnemonic precision and, second, brain activity measured during memory delay reflects the joint signatures of all items simultaneously held in vWM. To overcome these limitations we introduced a whole-report procedure in which participants successively reported all items held in vWM in a continuous report format. In a series of behavioral experiments, we characterized a stereotypic pattern of decline in precision across the report sequence caused by the interference of successive reports. Accounting for this interference enabled us to obtain precision estimates for all memorized items during the retention interval. Moreover, in a further study with a very high number of trials we combined the whole-report procedure with confidence ratings for each item’s mnemonic quality and performed cognitive modelling. This novel approach allowed improved estimation of memory precision on an item-by-item and trial-by-trial level that can be related directly to brain activity as measured, e.g., by magnetoencephalography.

The focus of attention in working memory: Investigating the retroactive cuing benefit by means of event-related EEG parameters

Schneider, Daniel; Barth, Anna; Wascher, Edmund
Leibniz-Institut für Arbeitsforschung an der TU Dortmund, Deutschland

Attention can be allocated toward mental representations in working memory also after the initial encoding of information. In a series of studies, we made use of retroactive attentional cuing (retro-cue) paradigms and event-
related EEG parameters to investigate the processes underlying a shift of attention within working memory. Participants had to remember the orientation of stimuli in a working memory task. Retro-cues indicated different numbers of items as relevant and a distractor display was presented after the retro-cue. On behavioral level, we found that retroactive cuing only led to a benefit in task accuracy compared to a condition without a cue when the focus of attention was reduced to one item. However, the interfering effect of the distractor display on memory performance could be prevented whenever a retro-cue reduced working memory load (e.g. also for a 2-item focus). This reduction of working memory load was reflected in a load-sensitive posterior negative slow wave and the suppression of alpha power over right-parietal sites. Additionally, oscillatory activity in the mu range (10-30 Hz), related to motor planning, revealed a suppression of power immediately after the retro-cue only when the focus of attention was reduced to one item. These results suggest that working memory load reduction is effective for releasing cognitive resources to prevent distractor interference. However, the retro-cue benefit results in large parts from the possibility to focus attention on one particular item in working memory and temporally separate motor planning processes from the processing of the probe stimulus indicating the respective decision.

The cost of processing multiple feature dimensions in visual working memory

Thomas Töllner
Ludwig-Maximilians-Universität München, Germany

Over the last two decades, there has been accumulating evidence that perceptual coding and selection decisions are modulated by an attention-guiding mechanism, which allocates limited ‘selection weight’ to the various target-defining dimensions (instead of features). While these dimension-specific weight settings bias target processing pre-attently (Töllner et al., 2008, 2010, 2012), it remains unknown whether later memory-related processes are also influenced by dimensional context. In this talk, I will highlight three event-related lateralization (ERL) studies designed to examine this issue. The first two studies used a retro-cue task to explore participants’ ability to access working memory (WM) representations as a function of dimensional context and task set. Our findings show that both factors selectively influence WM access: whereas cross-relative to intra-dimensional WM targets gave rise to amplified ERL waves, localization relative to identification task demands yielded speeded ERL and reaction times. The third study used an enumeration task to investigate whether the selection of multiple objects is dimensionally constrained. Behaviorally, enumeration responses were fastest for identical targets, slowest for cross-dimensional targets, and of intermediate speed for different, intra-dimensionally defined targets. EEG analyses disclosed that one source of this response slowing was feature-based and originated from the stage of attentional selection (as indexed by PCN waves), whereas another source was dimension-based and associated with WM (as indexed by P3b waves). As these dimension-based findings are not reconcilable with contemporary feature- and/or object-based accounts of WM, I will introduce an alternative view that is based on and extends the hierarchical feature-bundle model.

A Continuous Number Task (CNT) to evaluate different sub-mechanisms in Working Memory by means of event-related EEG activity

Wascher, Edmund; Zickerick, Bianca; Getzmann, Stephan; Arnau, Stefan; Schneider, Daniel; Thönnes, Sven
Leibniz Institut f.Arbeitsforschung a.d. TU Dortmund, Deutschland

In the present study we evaluated a new approach to working memory (WM) functions that should allow differentiating between remembering a stimulus and remembering a response, based on the same stimulus material. In the Continuous Number Task (CNT), a sequence of digits (1 - 6) was presented continuously. Participants had to make an odd-even decision either on the actual digit (Task: N0), the preceding digit (N-1) or the sum of the actual and the preceding digit (S-1). In N-1 the participants could evaluate the stimulus in advance and to store the response until the next stimulus was provided. In the EEG, prolonged mu-activity in the event-related spectral perturbations was observed that indicated continuing response storage. In S-1 (sum up of the last two stimuli) the current digit had to be remembered because no response could be assigned to a single element. In this case, sustained frontal negativity indicated that the digit was hold in a verbal loop. Relative to the immediate response (N0), P3b was delayed to the same amount in both WM conditions (N-1, S-1), independent of the moment of response. While in N-1 responses were faster than in N0, S-1 showed the slowest responses of all conditions. In N-1, P3b was time locked to overt responses. Thus, it reflected the moment when sufficient information for S-R mapping for the next upcoming response was available. In sum, by means of event-related EEG activity, a clear separation of sub-processes in this newly developed task was possible.
Biologische Korrelate dispositioneller Unterschiede in kontrolliertem vs. impulsivem Verhalten

Sören Enge & Alexander Strobel
Technische Universität Dresden, Deutschland
Raum: A 8


Neurophysiologische Aspekte von Impulsivität und Kontrolle: Der Zusammenhang von Persönlichkeit und Inhibition als exekutive Funktion

Enge, Sören (1,2); Sach, Mareike (2); Strobel, Alexander (2); Fleischhauer, Monika (3)
1: MSB Medical School Berlin, Deutschland; 2: Technische Universität Dresden, Deutschland; 3: PFH Private Hochschule Göttingen, Deutschland

Impulsivität kennzeichnet sich durch den graduellen Mangel an kontrolliertem, planvolleren und zielorientiertem Verhalten. Mit Blick auf die enorme konzeptionelle Breite des Impulsivitätskonstrukts in der aktuellen Literatur ergeben sich eine Reihe offener empirischer Fragestellungen. Dies bezieht sich etwa auf den weithin ungeklärten Zusammenhang zwischen impulsivitäts- (vs. kontroll-)assozierten Persönlichkeitseigenschaften einerseits und Impuls kontrol-
tion nahe, deren potenzieller Einfluss auf NFC in der vorliegenden Studie über genetische Variation in den Genen für das Dopamin-abbauende Enzym Catechol-0-Methyltransferase (COMT Val158Met) und den Dopamin-
D4-Rezeptor (DRD4 Exon III) untersucht wurde. In einer Stichprobe von N = 525 Individuen der Allgemeinbevölke-
rung fand sich eine Interaktion beider Gen-Varianten: das DRD4 Exon III 7-Repeat-Allel moderierte den Einfluss des
COMT Genotyps auf NFC, mit den höchsten Werten in NFC für 7-Repeat-Alll-Träger mit dem COMT Met/Met
Genotyp, der mit geringerem Abbau von Dopamin assozi-
iert ist. In einer Substichprobe von n = 252 zeigte sich
darüber hinaus, dass eine positive Evaluation zurückliegen-
der Lebensereignisse mit höherem NFC einherging, ein
Effekt, der sich insbesondere bei Trägern des DRD4 Exon III
7-Repeat-Allels fand. Die Ergebnisse unterstützen die
Annahme einer Rolle präfrontaler Dopamin-Funktion bei
der Modulation von NFC und deuten zudem auf einen
förderlichen Einfluss positiver Lebensereignisse auf NFC
hin.

Der Einfluss genetischer Variation des Serotonin-
Systems auf altruistische Bestrafung im
Ultimatumspiel: Ein longitudinaler Ansatz

Gärtner, Anne (1); Strobel, Alexander (1); Reif,
Andreas (2); Lesch, Klaus-Peter (3); Enge, Sören
(1,4)
1: TU Dresden, Deutschland; 2: Universität
Osnabrück, Deutschland; 3: Julius-Maximilians-Universität
Würzburg, Deutschland

Neuwissenschaftliche Studien weisen zunehmend darauf
hin, dass prososiales und kostspieliges Bestrafungsverhal-
ten (costly punishment) mit impuliven Verhaltensstilen
assoziert ist und durch das serotoninewesystem beein-
flusst wird. Individuelle Unterschiede im Bestrafungsver-
halten werden dabei zumindest teilweise durch serotonerne
Genvariationen moduliert. In dieser Studie wurde daher
untersucht, ob sich serotonerge Genvariationen (5-HTTLPR
und TPH2 G-703T Polymorphismus) auf altruistische
Bestrafung im Ultimatumspiel auswirken. Unter Anwen-
dung eines longitudinalen Ansatzes mit drei Untersuchungszeitpunkten über einen Zeitraum von vier Monaten
sollte außerdem die relative Stabilität des Bestrafungsver-
haltens geprüft werden. Bei N = 106 jungen Erwachsenen
waren 5-HTTLPR und TPH2 G-703T signifikant mit
altruistischer Bestrafung assoziiert: Träger des 5-HTTLPR
5-Allels in Kombination mit dem TPH2 G-Allel zeigten die
geringste altruistische Bestrafung. Ferner ergab sich eine
vergleichsweise hohe Stabilität des Bestrafungsverhaltens
(\(r = 0.6–0.8\)). Angaben zu selbstberichteter Ängstlichkeit
(STAI-T) und selbstberichtetem Altruismus (NEO-PI-R)

Neuronale Korrelate dispositioneller Gier in einem
Common Goods Dilemma

Mussel, Patrick (1); Osinsky, Roman (2); Hewig,
Johannes (3)
1: Freie Universität Berlin, Deutschland; 2: Universität
Osnabrück, Deutschland; 3: Julius-Maximilians-Universität
Würzburg, Deutschland

Dispositionelle Gier beschreibt den exzessiven Wunsch
nach mehr, koste es was es wolle. Wir untersuchten,
inwieweit gierige Personen im Vergleich zu weniger gieriger
Personen zu eigennützigem Verhalten neigen, auch wenn
dieses Verhalten auf Kosten einer anderen Person geht,
und ob diese Tendenz besonders ausgeprägt ist, wenn es
dabei um echtes Geld geht. An einer Stichprobe von 59
Probanden haben wir dafür dispositionelle Gier über einen
Fragebogen erhoben sowie ein Common Goods Paradigma
in einem 2*2-Design eingesetzt, wobei wir den Einsatz
(Geld vs. Punkte) und den Spiel-Partner (andere Person vs.
Computer) variierten. Gierige Personen zeigten mehr
außergewöhnliches Verhalten als weniger gierige Personen,
und dieser Effekt war besonders ausgeprägt, wenn die Proban-
den um echtes Geld und nicht um Punkte spielten. Dieser
Effekte schwächte sich jedoch ab, wenn der eigene Nutzen
auf Kosten einer anderen Person (vs. auf Kosten des
Computers) ging. Auf neuronaler Ebene untersuchten wir
mittels EEG die Verarbeitung des Feedbackreizes, der über
die Entscheidung des Partners informierte. Im ereigniskor-
rellierten Potenzial zeigte sich eine Positivierung an
centralen Elektroden für faire in Vergleich zu unfairen
Entscheidungen des Partners. In Übereinstimmung mit
bisherigen Befunden war diese Differenz bei gierigen
Personen weniger stark ausgeprägt als bei nicht-gierigen
Personen. Dieser Mechanismus, der in ähnlicher Form auch
bei Psychopathen beschrieben wurde, könnte indizieren,
dass gierige Personen weniger gut aus Fehlern und
negativen Rückmeldungen aus der Umwelt lernen und
daher eigenständlicher Verhalten, das mit negativen Konse-
quenzen für andere assoziiert ist, weniger gut regulieren.
Lieber den Spatz jetzt als die Taube später: Neuronale Korrelate zeitlicher Zielpräferenzen als Persönlichkeitsmarker?

Osinsky, Roman; Holst, Kristina; Ulrich, Natalie
Universität Osnabrück, Deutschland


SYMPOSIEN FREITAG
11:30-13:00

Stress Induction Methods: How to Perform a Stress Test – Concepts and Validation

Hartmut Schächinger & Gregor Domes
Universität Basel, Schweiz; Universität Trier, Deutschland
Raum: HS 1

Stress is a key concept in psychobiology – offering important implications for cognitive, affective, and clinical psychology. However, very many different stress induction techniques have been published, raising questions about which stress test to best use for which purpose. This symposium will offer a state-of-the-art summary on how to induce stress in human experimental research. We will hear about the Trier Social Stress Test (TSST), probably today's most influential human psychosocial stress test, and latest refinements of the TSST, by Gregor Domes. The Cold Pressor Test (CPT), although invented many decades ago, is currently experiencing a revival in psychobiological stress research. Many variants of the CPT have been published. They all share a core principle (impending heat and energy loss), but are hampered by different practical and theoretical pitfalls which will be carefully discussed by Mauro Larra. The unique MRI scanner environment represents a serious challenge when adapting standard stress tests for fMRI use. Stefan Wüst will present and discuss the latest stress induction methods suitable for application during fMRI. There are more physical stress tests, some of which offer a potential in human psychobiological stress research. Hartmut Schächinger will describe and briefly discuss some relatively seldom used techniques, as well as pharmacological approaches to induce stress. Julian Thayer will give an overview about mental arithmetic tasks and variants, focusing on neuropsychological and neuroscientific evidence. An invited discussant will briefly summarize the pros and cons of the different stress induction techniques presented.
The Trier Social Stress Test – recent developments and application in group settings

Domes, Gregor (1); von Dawans, Bernadette (2)
1: Universität Trier, Deutschland; 2: Universität Freiburg, Deutschland

Since its introduction 25 years ago the "Trier Social Stress Test" (TSST) has become a widely-used standard laboratory protocol for the induction of mild to moderate psychological stress. The TSST mainly comprises a mock job interview and a mental arithmetic in front of an audience, inducing social evaluative threat and uncontrollability. The TSST evokes psychological stress and a robust activation of the HPA-axis and the sympathetic-adrenal system in most participants. A number of adaptations and modifications have been developed and published over the last decades to meet the needs of research in specific environments (eg. functional imaging in an MRI scanner), with specific populations (eg. children and elderly) and in special settings (eg. groups). In our talk we will briefly summarize these modifications, and then focus on the potentials and challenges using the TSST for groups (TSST-G) for simultaneously inducing psychosocial stress in small groups of participants. After a short summary of the methodological particulars of the TSST-G, we will present an overview of the studies published with the TSST-G so far and recent data regarding variance components related to the individual and group membership. Finally, comparability to the single subject TSST and implications for future applications will be discussed.

The Cold Pressor Test as laboratory stressor:
Psychophysiological mechanisms, variations and practical issues

Larra, Mauro F.; Best, Daniel; Bachmann, Petra; Schächinger, Hartmut
Universität Trier, Deutschland

The Cold Pressor Test (CPT) was introduced almost a century ago as a standard stimulus to increase blood pressure and in its core consists of a procedure in which a part of the body is exposed to cold for a short period of time. Most research evaluating response specificity, individual variability and the impact of variations has been restricted to the analysis of cardiovascular and autonomic regulation. More recently, the CPT is experiencing a renaissance as a laboratory stress induction method whereby its endocrine effects, especially its capability to activate the HPA axis are of major interest. Variations have been introduced seeking to optimize it as a laboratory stressor especially with respect to the activation of the HPA axis and applicability in psychophysiological research settings. This talk will briefly summarize what is known about the psychophysiological mechanisms that mediate the response to the CPT. Frequently employed variants will be described and data are presented concerning their validity as a stress induction technique. An emphasis will be put on practical aspects when using the CPT as laboratory stressor and its advantages, limitations as well as potential caveats will be carefully discussed.

Psychological stress paradigms for neuroimaging studies

Wüst, Stefan (1); Streit, Fabian (2)
1: University of Regensburg, Deutschland; 2: Central Institute of Mental Health, Mannheim, Germany

Functional magnetic resonance imaging offers great potential to investigate psychological stress processing noninvasively in the human brain. Neuroimaging studies published in the last decade are – and this is consistent with stress research outside the scanner – characterized by marked variability in the methods used to elicit acute stress responses. Amongst others, they include social rejection paradigms, the Stroop-task and the presentation of visual emotional stimuli. These methods are surely well suited for specific research questions but the observed neural activation changes reflect negative affective processing, cognitive load and other processes. They can only hardly be predominantly interpreted as central stress response. Acute stress exposure causes an activation of the hypothalamus-pituitary-adrenal (HPA) axis and thus an increase of cortisol levels can be viewed as validation for imaging stress paradigms. Moreover, the interplay between central stress processing and HPA axis regulation itself is at the heart of psychobiological stress research. Consequently, recent paradigms focus on psychological components that are known to elicit cortisol responses such as uncontrollability, unpredictability and social-evaluative threat. The first and most established paradigm using this approach is the Montreal Imaging Stress Task (MIST). Our own group recently developed the ScanSTRESS paradigm. Our presentation will include a brief overview of recent findings and we will particularly discuss methodological challenges and opportunities from the perspective of psychobiological stress research.
Physiological “Stress Induction Methods” in Psychobiological Research

Schächinger, Hartmut; Best, Daniel; Finke, Johannes

Universität Trier

Stress physiology refined over hundreds of million years, and helped vertebrate species to survive attack and adapt to pernicious environments. Evidence suggests that neuro-humoral signaling of metabolic demands, threatened energy resources, and disturbed homeostasis was the primary afferent mechanisms eliciting a stress response. Not surprisingly, hypoglycemia (i.e. lack of the brain & body’s most significant energy carrier glucose) is among the strongest stressors ever been reported in human stress physiology. Similar is true for severe blood loss and/or low mean arterial blood pressure. Pharmacological methods are available to induce, control and maintain systemic hypoglycemia and hypotension. However, these manipulations depend on cooperation of medical staff and availability of emergency support. In this talk, they will briefly be discussed. Obviously, induction of hemorrhage (i.e. real blood loss) is not suitable in psychophysiological research. However, applying “lower body negative pressure” (LBNP) represents a feasible technique to simulate acute, profound (e.g. 500 ml) blood loss. This is, because LBNP is able to reversibly induce peripheral lower limb venous pooling of blood, thus, compromising the central systemic blood volume. The LBNP method is of potential use in psychobiology, especially, because it is characterized by excellent on/off timing potential, and dose-response characteristics. Other promising physiological stress tests, such as the hand grip task, will be presented, demonstrated, and discussed. The talk will close with recommendations (based on pharmacokinetik data), on how to administer stress hormones (e.g. cortisol, epinephrine) when testing the psychobiology of key efferent stress systems.

Mental arithmetic and beyond: Cognitive challenge in stress research

Thayer, Julian F (1); Koenig, Julian (2)

1: The Ohio State University, United States of America; 2: University of Heidelberg

“Count backwards from 1000 by 13” is a common refrain in psychophysiology laboratories around the world. Cognitive challenges such as mental arithmetic have a long history as stressors in psychophysiological research. These tasks have been used in psychophysiological research to “activate” the participant in an attempt to understand the physiological changes that accompany such activation. In particular, the idea of being able to quantitatively vary the degree of activation is appealing as researchers seek to estimate response functions over a range of activation states. Furthermore, recent advances in neuroimaging allow for the investigation of the neural concomitants of these tasks. In this talk, I will briefly review the literature on cognitive load and its relationship to both neurophysiological and peripheral psychophysiological responses. Recent data on cognitive and emotional interactions highlights the potential for common neurophysiological underpinnings for cognition, emotion, and stress. Single task and dual task manipulations provide further insights into the nature of cognitive stressors and the adjustments that are made to flexibly adapt to changing environmental challenges. Individual differences in such adaptation abilities have important implications for basic as well as applied research. It is hoped that this talk will inspire researchers to use cognitive challenges in their stress research and to stimulate further innovations in their application.

Methods in Neuropsychology

Martin Bleichner

Universität Oldenburg, Deutschland

Raum: A 9/10

Our understanding of the relationship between psychology, behaviour and brain processes is influenced and shaped by our research methods and by the tools we have at our disposal. The ongoing technical development for recording, manipulating and analysing brain processes allows us to address new research questions and to approach old research questions from new angles. In this symposium we will provide an overview of different methods and how they are used to study the brain. We present different possibilities of studying brain processes going beyond the classical lab setup using ear-EEG (electroencephalography). We demonstrate our approach of combination of ear-EEG, wireless signal acquisition, and smartphone based stimulus presentation and signal processing to study auditory attention. We present the possibilities of manipulating ongoing brain processes immediately and non-invasively using transcranial alternating current stimulation (tACS) and show how it can be used to study auditory perception. We present the possibilities of exploiting the properties of the hemodynamic brain signal on a single trial basis for brain computer interfaces (BCI) using functional near-infrared spectroscopy (fNIRS) as an alternative to EEG. Finally, we give an introduction to EEG source modelling and show how anatomical information can be used to facilitate the interpretation of the EEG signals, and will conclude with a presentation of the current developments in the field of source modelling.
Ear-EEG for real world EEG acquisition - transparent EEG using cEEGrid

Bleichner, Martin
Universität Oldenburg, Deutschland

“Recent developments in amplifier and sensor technology increase the possibilities of acquiring neurophysiological data away from the classical lab based experiment. We combine wireless EEG amplifiers with ear-centred electrode placement (cEEGrid) and use smartphones for signal acquisition, stimulus presentation, and signal analysis. In the context of tracking auditory attention in hearing aid users we work towards a fully ‘transparent’ EEG that allows continuous EEG acquisition without restricting the wearer in everyday activities. A transparent EEG could be easily ignored by its wearer and would not be readily noticeable by the people it interacts with. Such a system opens up new possibilities for long-term EEG acquisition in real-life situations and allows for new approaches for studying the brain-behaviour relationship in more realistic scenarios.

In this presentation we show how we use ear-centred EEG to study auditory attention. I will first present the general approach and principles of ear-EEG. Then I will present data of an auditory attention paradigm, where we directly compared high-density EEG and ear-EEG. I will show how much of the signal of interest is preserved using ear electrodes. Finally, I will present our approach of a smartphone based auditory attention brain computer interface system and will conclude with an outlook on the future developments of ear-EEG.”

Studying the role of neural oscillatory phase for auditory perception with transcranial alternating current stimulation (tACS)

Riecke, Lars
Maastricht University, Niederlande

Several neuroscientific studies have shown that auditory perception is associated with the phase of cortical oscillations as measured with neuroelectric-/-magnetic recordings. However, due to their correlational nature, these studies could not disambiguate whether cortical oscillatory phase plays a causal role for auditory perception or is merely a consequence of it. An alternative approach that enables to overcome this limitation is based on transcranial alternating current stimulation (TACS). TACS is a non-invasive brain stimulation technique involving the silent application of a weak alternating current to the scalp. Animal studies have shown that TACS can entrain the phase of neural oscillations, making it a suitable method for experimentally manipulating this phase and studying its causal influence on cognition. In this talk, I will provide an overview of recent studies that have exploited this modulatory ability of TACS to test causal roles of oscillatory phase in various aspects of auditory perception. Results show that the phase of slow neural oscillations in the delta and alpha range, specifically 4Hz and 10Hz, modulates the detectability of schematic sounds (tone pips and click trains) as well as the separability of more naturalistic sounds (harmonic tone sequences and speech) from background noise. Thus, slow oscillatory phase plays a causal role for auditory perception and selective hearing. Overall, TACS provides a powerful neuroscientific tool for uncovering mechanisms underlying auditory phenomena. Moreover, by this, it can open up new possibilities for clinical interventions aiming to support or restore these mechanisms.

Functional near-infrared spectroscopy (fNIRS) – a promising method towards convenient brain-based communication for ‘locked-in’ patients

Sorger, Bettina
Maastricht University, Faculty of Psychology and Neuroscience, Niederlande

“Human communication depends on the functional integrity of the neuromuscular system. In the so-called ‘locked-in’ syndrome (LIS), fully awake and conscious patients are incapable of communicating naturally due to severe motor paralysis. Brain-computer interfaces (BCIs) enable the read-out of different voluntarily controlled brain states in real time opening an alternative (motor-independent) communication channel for LIS patients who are otherwise isolated from the outside world.

During the last 30 years, most BCI researchers have focused on developing communication BCIs based on neuroelectric signals. More recently, hemodynamic brain signals as measured with functional magnetic resonance imaging (fMRI) and functional near-infrared spectroscopy (fNIRS) have been explored in the BCI context – demonstrating considerable clinical potential, especially for complete LIS patients. fMRI and fNIRS indirectly measure neural activity via its neurovascular response by exploiting the magnetic (fMRI) or optical (fNIRS) properties of the hemodynamic brain signal.

In this presentation, the audience will be first introduced to the general methodology of brain-computer interfacing (technical setup, suitable functional-neuroimaging methods, information encoding and decoding etc.). Then, I will focus on the increasingly applied fNIRS technique. fNIRS is safe, relatively easy to apply and portable – making it an ideal BCI technique. I will address the functional principles and practical/procedural aspects of fNIRS and compare it
Reconstructing well-localized brain activity with MEG/EEG sparse source imaging

Strohmeier, Daniel
TU Ilmenau, Deutschland

“The reconstruction of the neural generators underlying MEG or EEG signals allows analyzing brain activity noninvasively with high temporal and good spatial resolution. This is of avail for both basic neuroscience and clinical research. MEG/EEG source reconstruction requires the solution of the ill-posed bioelectromagnetic inverse problem. To find a stable and unique solution, constraints have to be applied reflecting a priori assumptions on the spatial and temporal characteristics of the brain activity. MEG/EEG sparse source imaging is based on a distributed source model and applies priors promoting spatial sparsity of the source estimate. This non-linear source imaging approach combines the benefits of both source imaging and multiple current dipole modeling and is applicable, e.g., for analyzing evoked brain signals. The resulting source estimates contain few active current dipoles representing neural activity in well-localized brain areas. Initial approaches for MEG/EEG sparse source imaging promoted unstructured sparsity, which can result in non-physiological source time courses. To overcome this issue, priors promoting structured sparsity are applied nowadays, which also reduce the sensitive to noise improving reliability and stability of the source estimates.

In the presentation, I will start with a general overview on MEG/EEG source reconstruction and introduce our approaches for MEG/EEG sparse source imaging. I will focus on techniques promoting structured sparsity in the time or time-frequency domain, which improve the reconstruction of spatio-temporally coherent well-localized source estimates. The presentation concludes with an overview on current research directions and future work.”

Multimodal investigation of trustworthiness and dominance processing – from perception to action

Alexander Lischke & Sina Radke
Universität Greifswald, Deutschland
Raum: A 8

During social interactions, individuals rapidly and automatically judge others’ trustworthiness and dominance on basis of subtle facial cues. Although these judgements do not necessarily have to be correct, they nonetheless affect current and future interactions with others. For instance, trustworthiness judgements have been shown to affect economic decisions in laboratory as well as in real-life settings. Despite the importance of trustworthiness and dominance judgements for social interactions, the behavioral and neural correlates of trustworthiness and dominance processing have rarely been studied. In consideration of this, we will present a series of studies that combine various methods to elucidate how facial cues of trustworthiness and dominance are processed on the behavioral and neutral level. Alexander Lischke will use behavioral and electrophysiological data to demonstrate how natural faces differing in trustworthiness are discriminated from one another. Sina Radke will use behavioral and pharmacological data to elucidate how computer-generated faces differing in trustworthiness modulate approach and avoidance behavior. Anett Mau-Möller will use behavioral...
Humans are a highly social species and almost all social interactions rely upon trust, regardless whether these interactions involve familiar or unfamiliar individuals. It, thus, seems reasonable to assume that evolutionary pressures shaped the development of neurobiological mechanisms that facilitate the recognition of and memory for untrustworthy and trustworthy individuals. To test this assumption, we performed a series of behavioral, psychophysiological and electrophysiological studies to investigate how participants processed natural faces that varied in trustworthiness. Despite the absence of a clear emotional expression, participants accurately and reliably discriminated trustworthy from untrustworthy faces. Untrustworthy faces were better recognized and better memorized than trustworthy faces, indicating that participants were particular sensitive to untrustworthy faces. Untrustworthy faces were better recognized and better memorized than trustworthy faces, indicating that participants were particular sensitive to untrustworthy faces. Accordingly, participants showed larger late positive potentials over tempo-parietal brain regions during the processing of untrustworthy as compared to trustworthy faces. Taken together, these findings suggest that humans are exceptional sensitive to subtle cues indicating the trustworthiness of others.

Implicit and explicit approach-avoidance tendencies to faces varying in trustworthiness and dominance

Radke, Sina (1); Wagels, Lisa (1); Derntl, Birgit (2)
1: Uniklinik RWTH Aachen, Deutschland; 2: Universität Tübingen, Deutschland

While approach-avoidance reactions to happy and angry faces are well-established, these motivational tendencies are also linked to the evaluation of objects and social targets. Grounded in the two fundamental dimensions of face-based evaluations proposed by Oosterhof & Todorov, the current study tested whether emotionally neutral faces varying in trustworthiness and dominance potentiate approach-avoidance. Computer-generated, validated faces signaling high and low trustworthiness and dominance (± 2 SD, respectively) were used to elicit motivational reactions in three approach-avoidance tasks, i.e., one implicit and one explicit joystick-based paradigm, and an additional rating task. In the joystick tasks, the movement of the joystick caused stimuli to grow (pull movement) or shrink (push movement) in size, creating the impression of moving towards or moving away from oneself. Reaction times and rating data were obtained from 50 healthy males along with endogenous and prenatal (2D:4D) indicators of testosterone in order to broaden our understanding of social motivational behavior.

Freezing in response to untrustworthy individuals

Mau-Moeller, Anett (1,2); Junge, Martin (3); Hamm, Alfons (3); Behrens, Martin (1); Weippert, Matthias (1); Dreyer, Thomas (1); Feldhege, Frank (2);
Lischke, Alexander (3,4)
1: Department of Sports Science, University of Rostock, Germany; 2: Department of Orthopaedics, University Medicine Rostock, Germany; 3: Department of Psychology, University of Greifswald, Germany; 4: Center for Diagnostic Radiology and Neuroradiology, University of Greifswald, Germany

Although freezing is a common outcome measure in animal studies investigating fear and anxiety, it has rarely been investigated in humans. However, recent studies suggest that is not impossible to investigate freezing in humans. According to these studies, humans also show body immobility and bradycardia in response to threat, suggesting that freezing is an evolutionary conserved defensive behavior across species. In the present study, we investigated, for the first time, whether social threat also elicits freezing responses in humans. Using posturography, we investigated changes in body sway in response to trustworthy and untrustworthy faces in 40 healthy participants. We found a robust and significant reduction in body sway in response to untrustworthy as compared to trustworthy faces, indicating freezing in response to social threat. Moreover, the reduction in body sway correlated significantly with measures of social anxiety, indicating that individual differences in social anxiety affect freezing responses to social threat. Taken together, these findings suggest that posturography may be a novel tool for investigating freezing responses to threat in humans.
Neural underpinnings of conditioned social dominance threat

Haaker, Jan (1,2); Molapour, Tanaz (2); Olsson, Andreas (2)
1: Universitätsklinikum Hamburg-Eppendorf, Deutschland; 2: Karolinska Institutet, Stockholm, Schweden

Social groups are organized along dominance hierarchies, which determine how we respond to threats posed by dominant and subordinate others. The persuasive impact of these dominance threats on mental and physical well-being has been well described, but it is unknown how dominance rank of others bias our experience and learning in the first place. I will present an experimental model of conditioned social dominance threat in humans, where the presence of a dominant other is paired with an aversive event. Within this model, we combined learning about the dominance rank of others with subsequent fear learning. In three separate experiments, we show that participants‘ eye blink startle responses and amygdala reactivity adaptively tracked dominance of others during observation of confrontation. Importantly, during fear learning dominant versus subordinate others elicited stronger and more persistent learned threat responses as measured by physiological arousal and amygdala activity. Additionally, I will present a following study that examined the influence of racial group belonging with dominance threats. Our results characterize the neural basis of learning about dominance rank in others, and how this affects subsequent learning through direct, personal experiences.
subklinischer SAD hat. Dies gilt es bei zukünftiger Forschung noch stärker zu berücksichtigen.

Beeinflusst die Antizipation unterschiedlicher Bedrohung (sozial vs. körperlich) die Verarbeitung entsprechender bedrohungs-relevanter Stimuli?

Wieser, Matthias (1,2); Reicherts, Philipp (2); Juravle, Georgiana (3); von Leupoldt, Andreas (4)

1: Erasmus Universiteit Rotterdam, Niederlande; 2: Universität Würzburg; 3: Lyon Neuroscience Research Center; 4: Katholieke Universiteit Leuven


Neuronale Grundlagen der Furchtkonditionierung bei Sozialer Angststörung

Hermann, Andrea; Neudert, Marie Kristin; Kruse, Onno; Stark, Rudolf

Professur für Psychotherapie und Systemneurowissenschaften & Bender Institute of Neuroimaging, Justus-Liebig-Universität Gießen

Effekte von sozialem und nicht-sozialem Stress auf Sozialverhalten unter Berücksichtigung sozialer Angst

davon Dawans, Bernadette (1); Trüg, Amalie (1); Kirschbaum, Clemens (2); Fischbacher, Urs (3); Heinrichs, Markus (1)
1: Albert-Ludwigs-Universität Freiburg, Deutschland; 2: TU Dresden; 3: Universität Konstanz


Interaktionsverhalten nach Stress und modulierende Effekte von Empathie bei Sozialer Angststörung

Trüg, Amalie A. (1); Voncken, Marisol (2); Hofmann, Stefan G. (3); Kirschbaum, Clemens (4); Heinrichs, Markus (1); von Dawans, Bernadette (1)
1: Universität Freiburg, Deutschland; 2: Maastricht University, Netherlands; 3: Boston University, USA; 4: Technische Universität Dresden, Deutschland

Wie beeinflusst soziale Angst die Aufmerksamkeit auf Mitmenschen?

Gamer, Matthias; Rubo, Marius
Universität Würzburg, Deutschland


Molekulargenetik interindividueller Differenzen

Martin Reuter
Universität Bonn, Deutschland
Raum: A 9/10

"Interindividuelle Differenzen menschlichen Verhaltens haben erwiesenermaßen eine stark erbliche Komponente und dies unabhängig davon, ob es um kognitive, affektive oder soziale Prozesse im Normalbereich oder die Erklärung psychopathologischer Zustände geht. Die Gene, die diese Erblichkeit ausmachen, haben sowohl einen Einfluss auf die Stoffwechselprozesse als auch auf die neuronalen Schaltkreise des Gehirns (Fiebach). In der molekulargenetischen Forschung wird versucht, Gen-Phänotyp-Assoziationen zu identifizieren und darüber hinaus auch die Funktionalität der Gene nachzuweisen. Das vorliegende Symposium stellt neue Erkenntnisse der molekulargenetischen Forschung vor und zeigt neue Forschungsperspektiven auf, die die Genetik mit anderen neurowissenschaftlichen Methoden verbindet, um die Grundlagen von Unterschieden im menschlichen Verhalten zu ergründen. Es werden neben genetischen Assoziationsstudien genetische Bildgebungsstudien (Fiebach) und experimentelle und klinische Ansätze präsentiert. In zwei Beiträgen geht es um Emotionsverarbeitung (Deris, Armbruster). Die Bedeutung genetischer Marker für Persönlichkeit (Reuter) wird ebenso thematisiert wie genetische Risikofaktoren für psychische Erkrankungen, die auch die Rekonvaleszenz vorhersagen können (Felten).

Das Symposium soll aufzeigen, dass genetische Forschung elementar für die neurowissenschaftliche Forschung ist, aber dass die Kombination vieler Methoden der vielseitigsten Weg ist."

Genetische Aspekte moralischen Urteils: Die Bedeutung des CHRNA4-Gens

Deris, Nadja (1); Melchers, Martin (1); Feltien, Andrea (1); Plieger, Thomas (1); Zamoscik, Vera (2); Kirsch, Peter (2); Colzato, Lorenza (3); Reuter, Martin (1)

1: Universität Bonn, Deutschland; 2: Universität Heidelberg, Mannheim; 3: Universität Leiden, Niederlande


Aus dem Takt? Variationen in Clock-Genen und emotionale Reaktivität

Armbruster, Diana (1); Grage, Tobias (1); Witt, Stephanie (2); Lesch, Klaus-Peter (3); Strobel, Alexander (1)

1: TU Dresden, Deutschland; 2: ZI Mannheim, Deutschland; 3: Universität Würzburg, Deutschland


Assoziation zwischen einer funktionellen Genvariante auf dem Dopamin-β-Hydroxylase Gen und Reward Dependence in zwei unabhängigen Stichproben

Reuter, Martin (1); Melchers, Martin (1); Felten, Andrea (1); Market, Sebastian (1); Montag, Christian (2); Plieger, Thomas (1)
1: Universität Bonn, Deutschland; 2: Universität Ulm, Deutschland

"Robert Cloningers biosoziale Persönlichkeits-Theorie postuliert eine biologische Basis für die basalen Temperaments- und Emotionsleistungen des Menschen. Mit Hinblick auf die Dimension Reward Dependence (RD), die durch eine Tendenz charakterisiert ist, Verhalten aufrecht zu erhalten, das bereits in der Vergangenheit meist durch die soziale Umwelt belohnt wurde, postulierte er z.B. niedrige Noradrenalintransporter. Es gibt einige endokrinologische und genetische Studien, die diese Hypothese stützen. Die aktuelle Studie versucht hier einen weiteren Beitrag zu leisten, indem der potentielle Einfluss zwischen dem single nucleotide polymorphism (SNP) rs1611115 (C-970T, früher auch bekannt als C-1021T) auf dem Dopamin-β-Hydroxylase (DBH) Gen und RD getestet wird. DBH ist ein Enzym, das entscheidend für die Synthese des Neurotransmitters Noradrenalin ist, indem es die oxidative Hydroxilierung von Dopamin zu Noradrenalin katalysiert. In zwei unabhängigen Stichproben (N = 1144 und N = 826) gesunder Probanden ergaben sich signifikante Genefekte (p ≤ 0.0001 und p ≤ 0.05). Träger mindestens eines C Allels (Genotypen CC und CT) zeigten signifikant höhere RD-Werte als Probanden, die homozygot für das T Allel waren (Genotyp TT).

Obwohl die generelle Hypothese eines Zusammenhangs zwischen RD und Noradrenalin bestätigt werden konnte, widerspricht die Richtung des gefundenen Effekts Cloningers Annahmen. Basierend auf früheren funktionellen Studien, die eine geringe Enzymaktivität mit dem TT Genotyp in Zusammenhang bringen, deuten die Ergebnisse der vorliegenden Studie darauf hin, dass hohe Noradrenalintransporter auch mit hohen RD-Werten einhergehen. Zukünftige Studien müssen u.a. auch der Frage nachgehen, wie DBH und Noradrenalintransporter von der Verfügbarkeit von Dopamin abhängen."

Genetische Variationen auf dem Noradrenalintransporter sagen die Remission von Depressionen vorher: Ergebnisse einer 2-Jahres-Katamnesestudie

Felten, Andrea; Deris, Nadja; Plieger, Thomas; Melchers, Martin; Reuter, Martin
Universität Bonn, Deutschland

**Interozeption und Stress: die Psychophysiologie der bi-direktionalen Kommunikation auf der Hirn-Körper-Achse**

André Schulz  
*Universität Luxemburg, Luxemburg*

Raum: A 8


**Zusammenhang zwischen interzeptiver Genauigkeit und kardiovaskulärer Veränderung nach akutem Stress bei gesunden Frauen**

Rost, Silke; van Dyck, Zoé; Schulz, André; Vögele, Claus  
*Universität Luxemburg, Luxemburg*

Die Auswirkungen von Arbeitsbelastung und Interzeptionsfähigkeit auf gesundheitliche Beschwerden.

Trojan, Jörg; Ketterer, Nadine; Schröder, Annette
Universität Koblenz-Landau, Deutschland


Interzeptive Akkuranz und das herzschlagevozierte Potenzial bei Jugendlichen

Mai, Sandra; Georgiou, Eleana; Pollatos, Olga
Universität Ulm, Deutschland


Langzeitkonsequenzen von frühkindlichem Stress: quadrischer Zusammenhang zwischen Stress und Interzeptionsfähigkeit

Schaan, Violetta; Schulz, André; Vögele, Claus
Universität Luxemburg, Luxemburg

"Traumatische Belastungen während der Kindheit können das Risiko für die Entwicklung unsicherer Bindungsstile erhöhen, die bereits mit langfristigen psychischen und körperlichen Gesundheitsproblemen in Beziehung gebracht wurden. Die zugrundeliegenden Prozesse sind allerdings noch weitestgehend unklar. Da interzeptive Signale die Regulation negativer Emotionen als Reaktion auf sozialer Zurückweisung begünstigen können, die inzolger einer Stressbelastung verändert sein könnten, wurde insbesondere der Effekt von kindlichem Stress auf Interzeption untersucht.

Wir präsentieren zwei Studien, die den Zusammenhang zwischen kindlichem Stress und Gesundheit im Erwachse-
nenalter sowie Körperwahrnehmung und Gedächtnisfähigkeit untersuchen.

In der ersten Studie nahmen 199 Teilnehmer an einer Onlineumfrage teil, bei der Gesundheit, frühkindliches Trauma, Resilienz und Zurückweisungssensitivität gemessen wurden. Teilnehmer mit geschiedenen Eltern berichteten erhöhte psychische Belastungswerte, kindliches Trauma, Zurückweisungssensitivität und weniger Resilienz. Die Beziehung zwischen elterlicher Scheidung und psychischer Gesundheit konnte vollständig durch diese vier Faktoren erklärt werden (Varianzaufklärung 44%).


**Unterschiede in der Gehirn-Körper Interaktion bei Patienten mit kindlicher Traumatisierung:**

*Borderline-Persönlichkeitsstörung und Posttraumatische Belastungsstörung*

Müller, Laura Elisa; Monzer, Nelly; Kolbeschlag, Christina; Herpertz, Sabine; Bertsch, Katja

*Uniklinikum Heidelberg, Deutschland*

Individually differences and neural correlates of shape and texture contributions to the recognition of personally familiar faces

Kaufmann, Jürgen M. (1,2); Itz, Marlena L. (1,2); Schweinberger, Stefan R. (1,2)
1: Department of Psychology, Friedrich Schiller University of Jena, Germany; 2: DFG Research Unit Person Perception, Friedrich Schiller University of Jena, Germany

We tested effects of reduced identity information in either shape or texture on personally familiar face recognition. Stimuli were derived from images captured with a 3D camera-system. Behavioural data and event-related potentials (ERPs) were analysed. In Experiment 1, participants performed a face familiarity task on personally familiar and unfamiliar faces, shown as i) original images, including shape and texture information; ii) “shape masks”, based on 3D vertices; and iii) flattened “texture maps”. Performance was best for original faces, followed by texture maps, and poorest for shape stimuli. N250 familiarity effects were largest for original faces, reduced for texture maps, and non-significant for shape masks. Experiment 2 used a similar design, with the difference that “shape-only” stimuli now consisted of individual shape combined with an average texture, whereas “texture-only” faces showed individual texture combined with an average shape. Again, performance was best for originals, followed by texture and poorest for shape stimuli. Significant N250 familiarity effects were found for all three conditions, but the effect was smallest for shape stimuli. There were positive correlations between the sensitivity index d’ for originals, shape and texture stimuli and scores in a face learning (Cambridge Face Memory Test) and a famous face recognition test (Bielefelder Famous Faces Test). Overall, the results suggest that recognition of personally familiar faces is mainly, albeit not exclusively, driven by texture information, and that good face learning and recognition skills are associated with a flexible use of shape and texture, depending on the information available in the stimulus.

Impacts of Associated Motivational Salience on Human Face Processing

Annekathrin Schacht
Institut für Psychologie, Georg-August-Universität Göttingen, Deutschland

Facial expressions of emotion have an undeniable processing advantage over neutral faces, discernible both at behavioral level and in emotion-related modulations of several event-related potentials (ERPs). Recently it was
Impact of self-other-reference on emotional face processing

Herbert, Cornelia

University of Ulm, Deutschland

We smile, laugh, sulk and frown to express own emotions or to simulate, synchronize and empathize with other people’s emotions. Hence, in social interactions faces can signal both, the sender’s own emotion or his/her simulation of the perceiver’s emotions. In this talk, results from a series of EEG and behavioral studies will be presented investigating how self-other reference influences the time course of emotional face processing during passive and active processing conditions. Self-other reference of emotional faces was experimentally manipulated by verbal cues describing either participants’ own emotion or the sender’s facial emotion. Participants’ task was to a) read and simply view the word-face pairs, b) use the cues to regulate emotions in response to the faces or c) recognize the facial emotion displayed. Results suggest that self-other reference has an immediate impact on emotional face perception especially during spontaneous processing (passive viewing). During active regulation particularly processing of self-related cues seems to facilitate temporarily later processing stages associated with encoding of emotional faces. Interestingly presentation of simple cues such as self- and other-referential pronouns (my/his/her) seems sufficient to alter facial emotion recognition on a behavioral as well as on a cortical processing level, even when only parts of the face (eye region) are presented. Taken together, the results suggest that self-other-reference is a significant predictor of emotional face processing across tasks and emotion categories including sadness, fear, anger or happiness.

Person perception as a function of instructed threat and safety: An ERP study

Bublatzky, Florian (1); Guerra, Pedro (2); Alpers, Georg (1)

1: University of Mannheim, School of Social Sciences, Chair of Clinical and Biological Psychology and Psychotherapy, Germany; 2: Department of Personality, Assessment and Psychological Treatment, University of Granada, Spain

The human face informs about the identity and emotions of other people. Importantly, perception of these cues often depends on what we have previously learned about these persons. Using an instructed threat and reversal approach, the present study examined the impact of verbal threat and safety learning on the perception of facial emotion and identity. Face pictures of four persons displaying happy, neutral, and angry expressions were presented in a continuous picture stream while EEG and self-reported threat was assessed. In separate experimental blocks, 33 participants were instructed about threat/safety contingencies linked to a person’s identity (Block 1: Person A and B indicate threat, C and D safety) and partly reversed (Block 2: now Person B cues safety and D threat). Furthermore, a passive viewing block served as no-threat control condition. Main effects of facial emotion (P1, N170, EPN, LPP) and instructed threat (EPN, LPP) were observed. Importantly, the N170 component varied as a joint function of instructed threat and facial emotion. N170 amplitudes were similarly pronounced for faces cueing threat or safety when displaying anger. However, selective safety-cue processing (relative to threat-identities) was observed specifically for happy expressions. Moreover, reversal instructions were associated with pronounced N170 and EPN amplitudes especially for angry faces. Thus, a smile may be more readily perceived as signaling safety than threat, and a safe but angry person may easily be reversed as threat-cue. Taken together, early face encoding selectively varies according to the mere verbal communication about whether a person is dangerous or safe.
Modulation of psychophysiological responding to loved familiar faces by verbal threat learning

Guerra, Pedro M. (1); Morato, Cristina (1); Mena, Teresa (1); Bublatzky, Florian (2)
1: University of Granada, Spain, Spain; 2: Universität Mannheim

Previous research has shown that the visualization of loved familiar individuals elicits a highly positive emotional state that is reflected across different response systems in the body. Moreover, these changes cannot be attributable to either familiarity or undifferentiated emotional arousal. Accrued evidence suggests that these stimuli might serve as evolutionary prepared safety signals. Building upon these findings, the current study aimed at examining whether physiological responses to loved familiar faces could be modulated as a function of verbal threat/safety instructions. Participants were presented with pictures belonging to two categories (loved vs. unknown) while a broad set of both central (ERPs) and peripheral (heart rate, skin conductance, and facial EMG) responses were recorded. Instructions were manipulated so that half of the pictures within each category signaled either threat or safety (counterbalanced across subjects). Preliminary results are in line with previous findings regarding physiological responding to loved familiar faces. In addition, verbal instructions were effective at modulating the expected pattern of responses to loved familiar stimuli: loved faces cueing threat were associated with potentiated startle reflex, diminished corrugator inhibition, increased skin conductance, and heart rate deceleration, compared to loved faces cueing safety. In summary, the current study shows that physiological responding to loved familiar faces is sensitive to verbal threat learning. Implications of the present findings are discussed with regard to the hypothesis that attachment figures may serve as prepared safety stimuli contributing to the health benefits associated with social support.

Human communication via chemosensory signals

Christina Regenbogen & Rea Rodriguez-Raecke

Uniklinik Aachen, Deutschland
Raum: A 9/10

Humans communicate through a multitude of senses. They exchange information on a semantic level by talking, wrap this information in a specific tone of voice, and add certain facial expressions to effectively communicate emotions. What happens on a less conscious and more subtle level, that humans also communicate via chemosensory signals, will be the focus of this symposium. We will present an overview on behavioral and neuroimaging results investigating the effects of olfactory stimuli. The symposium will be introduced by Jasper de Groot who will present a recently carried out meta-analyses on the robustness of research on the human capacity to chemically communicate emotions. Rea Rodriguez-Raecke will outline basic processes involved in odor masking on a neural level, followed by Olga Wudarczyk who will present an fMRI study highlighting impairments of integrating olfactory and visual anxiety cues in patients with autism spectrum disorder. Christina Regenbogen will present a study on how olfactory and visual sickness cues are integrated in the brain and influence social liking and Jessica Freiher will round up the symposium by presenting a line of experiments on aggression chemosignaling and the impact on human behavior.

Meta-Analyses on Human Fear Chemosignaling

de Groot, Jasper

Utrecht University, Utrecht, the Netherlands

Human body odors have long been examined as a possible medium for social communication. What may have eroded the general confidence in research on human olfactory communication are non-replications, especially in the field of body odor-based menstrual synchrony. Here, we statistically assess whether these concerns generalize to another social communication subfield examining the potential of body odors to "communicate" emotions from one person to another, namely the state of fear, stress, and anxiety (collectively labeled: fear chemosignaling). The 17-year harvest of 26 fear chemosignaling studies (N = 1 770) and the current replication crisis make for two timely and important questions: Is there "evidence of evidence" for fear chemosignaling? What is the size of the effect? These questions were answered by combining two novel meta-analytical tools, p-curve and p-uniform analysis, assessing (the strength of) the evidence based on the distribution of p-values. The results of even the most conservative approaches revealed significant "evidence of evidence" for fear chemosignaling (p-values < .0001); the unbiased effect size was between small to moderate (Hedges’ g = .34, 95% CI: .21-.48; confirmed by sensitivity analysis). The combined results highlight the robustness of research on the human capacity to chemically "communicate" emotions such as fear.
The challenge of masking an aversive odor

Rodriguez-Raecke, Rea (1,2); Loos, Helene (2); Sijben, Rik (1); Singer, Marco (3); Beauchamp, Jonathan (2); Buettner, Andrea (2,4); Freiherr, Jessica (1,2)

1: Diagnostic and Interventional Neuroradiology, University Hospital, RWTH Aachen University, Germany; 2: Department of Sensory Analytics, Fraunhofer Institute for Process Engineering and Packaging IVV, Freising, Germany; 3: Scent & Care, Symrise AG, Holzminden, Germany; 4: Department of Chemistry and Pharmacy, Friedrich-Alexander Universität Erlangen-Nürnberg, Erlangen, Germany

A fully masked aversive odor in comparison to a pure pleasant odor might be processed differently, even if the participants cannot perceptually discriminate them. Our hypothesis is that perceptual discrimination and neuronal processing can possibly be enhanced by using a reinforcing feedback paradigm. The participants rated both odors as isopleasant and isointense and performed at chance level in discriminating differing odor pairs and above chance level in identifying same odor pairs in this task. A subgroup that was established using the signal detection theory, showed a significant improvement throughout the task and performance above chance level in discriminating same and different odor pairs. Comparing neuronal processing of a pure, pleasant lemon odor to a fully masked aversive odor consisting of a lemon odor and caproic acid (smelling goat-like), we observed increased activation of the left insula and ventral striatum/putamen in the pure odor compared to the masked odor. The superior performing subgroup improved in differentiating the odors with reinforcement and showed a related activation of dorsal anterior cingulate cortex, midcingulate cortex, operculum and primary somatosensory cortex compared to the other participants. In conclusion, these areas are probably involved in odor discrimination and learning, and processing of odors seems to depend on even subtle changes of odor quality.

The impact of olfactory cues of anxiety on perception of fearful faces in Autism Spectrum Disorders – an fMRI investigation

Wudarczyk, Olga Anna (1); Kohn, Nils (2); Bergs, Rene (1); Schneider, Frank (1); Habel, Ute (1)

1: RWTH Aachen University, Germany; 2: Donders Institute for Brain, Cognition and Behaviour, Radboud University

Although recent evidence suggests that humans communicate emotion via chemosensory cues, it is still poorly understood how chemosensory signals are processed in neuropsychiatric populations. In the current investigation, we examined how olfactory anxiety cues (axillary sweat collected from students awaiting an oral examination) versus control cues (axillary sweat collected during exercising) affect perception of fearful faces in patients with Autism Spectrum Disorders (ASD), a condition characterized by impaired socio-emotional interactions and sensory processing. Seventeen ASD patients and 17 matched controls (HC) completed a parametrically morphed (neutral-to-fearful) emotion perception task under exposure to chemosensory anxiety and sports cues, during fMRI. At the behavioural level, we observed that HC showed higher fear ratings under anxiety cues to increasingly more fearful faces (a significant linear trend: p<.05), whereas ASD patients showed weaker variability in fearfulness ratings in response to chemosensory cues. At the brain level, while HC showed increased activity in the insula, thalamus and MFG to increased facial fearfulness under anxiety cues, similar modulation was not observed in ASD patients. Further, anxiety cues led to significantly stronger activity in visual processing regions including lingual gyrus and calcarine across emotional faces in HC as compared to ASD patients. These findings suggest differential effects of chemosensory cues on socio-emotional processing in the two populations. While anxiety cues facilitate processing of socially relevant fearful stimuli in healthy individuals, the current results suggest aberrant integration of emotional information from olfactory cues in context of emotional faces in ASD patients.

Multisensory sickness detection

Regenbogen, Christina (1,2,3); Axelsson, John (1,4); Lasselin, Julie (1,4,5); Porada, Danja K (1); Sundelin, Tina (1,6); Peter, Moa G (1); Lekander, Mats (1,4); Lundström, Johan N (1,7,8); Olsson, Mats J (1)

1: Department of Clinical Neuroscience, Karolinska Institutet, Stockholm, Sweden; 2: Department of Psychiatry, Psychotherapy and Psychosomatics, Medical School, RWTH Aachen University, Aachen, Germany; 3: JARA - BRAIN Institute 1: Structure Function Relationship, Jüllich, Germany; 4: Stress Research Institute, Stockholm University, Frescati Hagväg 16A, 106 91 Stockholm, Sweden; 5: Institute of Medical Psychology and Behavioral Immunobiology, Universitätsklinikum Essen, Hufelandstr. 55, 45 122 Essen, Germany; 6: Department of Psychology, Stockholm University, Stockholm, Sweden; 7: Monell Chemical Senses Center, Philadelphia, PA, USA; 8: Department of Psychology, University of Pennsylvania, Philadelphia, PA, USA

Through human evolution, infectious diseases have been a primary cause of death. Detection of sickness cues and avoidance of sick conspecifics would therefore be an adaptive way of coping with an environment fraught with
pathogens. This study determines, for the first time, how humans perceive and integrate early sickness cues of conspecifics sampled just hours after the induction of immune system activation, and the underlying neural mechanisms for this detection. In a double-blind placebo-controlled crossover design, the immune system was transiently activated in 22 sample donors with an endotoxin injection (lipopolysaccharide, LPS). Facial photographs and body odor samples were taken from the donors when ‘sick’ (LPS) and when ‘healthy’ (saline) and subsequently presented to a separate group (N=29) during fMRI scanning during which participants rated their liking of the presented person. Faces were less socially desirable when sick, with sick body odors tending to lower liking of the faces. Sickness in odor and face resulted in increased neural activation of odor and face perception networks, respectively. A superadditive effect of olfactory-visual integration of sickness cues was found in the intraparietal sulcus, which was functionally connected to core areas of multisensory integration in the superior temporal sulcus and orbitofrontal cortex. Altogether, the results outline a disease avoidance model in which neural mechanism involved in the detection of disease cues and multisensory integration are vital parts.

Chemosensory danger detection in the human brain

Mutic, Smiljana; Freiherr, Jessica
RWTH Aachen University, Deutschland

“In the detection of dangers, the sense of smell has proven an important role. Besides environmental dangers, also socially dangerous situations are commonly communicated via odors in mammals within a species: For humans, first evidence of the communication of aggression and competition-related information via body odor is arising. We here ask the following questions: 1. Is an intention to attack conveyed via body odor from a male combative sender to a recipient? 2. Do aggression chemosignals activate a neural alarm system in the brain? To answer those questions, body odors during an exercise and an aggression condition were sampled from 16 healthy male donors and were used during a behavioral and a neuroimaging application study both using an emotional Stroop paradigm. The behavioral data indicate an exclusive impairment of the processing of anxiety-related words by aggression chemosignals which is interpreted as time-sensitive attentional bias in chemosensory danger detection. During exposure to aggression chemosignals compared to exercise chemosignals, functional imaging data exhibit an activation of thalamus, hypothalamus and insula (p < .05, FWE-corrected). Together with the thalamus, the ACC was seen activated in response to threat-related words only (p < .001). Impact and limitations of aggression chemosignalling on human behavior will be discussed.

This research is supported by a grant from the Interdisciplinary Centre for Clinical Research within the faculty of Medicine at the RWTH Aachen University, Germany.”

SYMPOSIEN SAMSTAG
12:00-13:30

Genetic approaches to psychobiological stress research in humans

Stefan Wüst & Robert Kumsta
University of Regensburg, Deutschland
Raum: HS 1

“In interaction with the environment, gene variants involved in stress processing modulate the risk for psychopathology. The use of genetic approaches offers great potential to detect stress-related disease mechanisms in humans. In this symposium, we aim to present studies that explore the genetic architecture of stress-related phenotypes using a range of different methods. Fabian Streit will present a twin study that estimated the heritability of hair cortisol concentrations (HCC) and analyzed if HCC and stress-related psychological variables share common genetic factors. Based on genome wide association studies, polygenic risk scores were calculated to investigate if genetic variation shown to be associated e.g. with major depression does also explain variance in HCC.

Robert Kumsta will present results of a genetically informed experience sampling study. This approach is well suited to study immediate gene-environment interaction on the micro-level with high ecological validity. Results on the effects of both stressful and positive experience on mood, and the moderating role of genetic factors will be reported.

Finally, we will report findings supporting the view that the neuropeptide S system modulates stress regulation. As NPS receptor (NPSR1) (antagonist for human pharmacological studies are not available, candidate gene studies are a useful approach to probe this system. Frauke Nees presents findings on associations between brain activation patterns and NPSR1 genotype in a cue fear condition paradigm and Stefan Wüst will report associations between NPSR1 variants and cortisol responses to the TSST as well as neural stress responses to a stress paradigm for scanner environments.”
Genetic Contribution to Cortisol Concentration in Hair: Assessing the Heritability and Genetic Overlap with Psychological Variables

Streit, Fabian (1); Rietschel, Liz (2); Zhu, Gu (3); McAloney, Kerrie (3); Frank, Josef (1); Couvy-Duchesne, Baptiste (3,4); Witt, Stephanie H. (1); Binz, Tina (6); Consortium, CORTisolNETwork (CORNET) (1); Psychiatric GWAS Consortium, Major Depressive Disorder Working Group of the (1); McGrath, John (4,7,8); Hickie, Ian B. (9); Hansell, Narelle K. (4,5); Wright, Margaret J. (4,5); Gillespie, Nathan (3,10); Forstner, Andreas J. (11,12, 13,14); Schulze, Thomas G (2, 15,16, 17,18); Wüst, Stefan (2,19); Nöthen, Markus M. (11,12); Baumgartner, Markus (6); Walker, Brian R. (20); Crawford, Andrew A. (20,21); Colodro Conde, Lucia (3); Medland, Sarah E. (3); Martin, Nicholas G. (3); Rietschel, Marcella (1)

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"Assessing cortisol - the end product of the hypothalamus-pituitary-adrenal (HPA) axis - in hair is a promising measure of long-term HPA axis activity. Hair cortisol concentration (HCC) has been found associated with stress and psychiatric disorders. However, the contribution of genetic factors to inter-individual variance in HCC and the extent to which the genes influencing HCC also account for inter-individual differences in psychological variables are unknown. This study aims to use MZ and DZ twins to i) assess the heritability of HCC and ii) estimate the genetic and environmental association of HCC with psychological variables, viz. perceived stress, depressive symptoms and neuroticism; iii) investigate if polygenic risk scores (PRS) based on previously reported large genome wide association studies for plasma cortisol, major depression (MDD), and neuroticism explain variance in HCC and the psychological variables.

Cortisol concentration was measured in hair samples from 671 individuals (mean age = 14.5 years) including 115 MZ and 183 DZ twin-pairs. Psychological measures were assessed with self-rating questionnaires. PRS analyses were performed in 432 of these subjects who had previously been genotyped genome-wide. The twin model revealed i) a heritability of HCC of 72%, but ii) no significant phenotypic nor genetic overlap of HCC with psychological variables or PRS. In conclusion: HCC is substantially influenced by the genetic make-up of an individual. The lack of shared phenotypic/ genetic correlation with any of the psychological variables may be due to the restricted phenotypic variation in this sample of adolescents from the general population."

Examination of immediate gene–environment interplay by means of experience sampling

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A gene–environment interaction (GxE) is observed when the effects of environmental influences are dependent on genetic background. Most GxE research is based on vulnerability-oriented hypotheses, with a focus on the effects of unfavourable environments or adversity. The differential susceptibility hypothesis suggests that individuals are not just more vulnerable than others to the negative effects of adversity, but also disproportionately susceptible to the beneficial effects of supportive and enriching experiences. Here we tested this hypothesis on the micro-
level by means of the Experience Sampling Method. 350 individuals were genotyped for a common polymorphism in the serotonin transporter gene promoter (5HTTLPR), and two oxytocin receptor gene (OXTR) single nucleotide polymorphism (rs53576 & rs2268498). Sampling periods consisted of four days with 4 assessments per day. Participants indicated whether they had experienced negative (e.g. time pressure, social devaluation, conflict) or positive events (e.g. receiving a compliment or praise, successful completion of a task) in the 60 minutes before the prompt, and provided ratings of their mood, positive and negative perceptions of company, loneliness, and their willingness to interact socially. We will specifically test whether carriers of the 5HTTLPR s-allele are more sensitive to both negative and positive experiences, and we will test whether OXTR polymorphisms moderate the stress buffering effect of positive social interaction and social support. Results will be presented at the conference.

Effects of the Neuropeptide S gene on fear, anxiety and chronic stress in humans

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Pohlack, Sebastian (1); Winkelmann, Tobias (1);
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Objective: The G protein-coupled receptor neuropeptide S receptor 1 (NPSR1) and its ligand neuropeptide S (NPS) form a signaling system implicated in susceptibility for human anxiety disorders. Yet, divergent patterns of NPS effects on fear and anxiety were reported for animals and humans and also across human studies, and thus a better understanding of the underlying mechanisms of NPS effects is needed. Method: In the present study, we examined two samples of healthy individuals (N=116; N=108) with different levels of daily stress exposure to test the effect of the NPSR1 polymorphism rs324981 (A/T) on fear learning and anxiety. We measured skin conductance, self-report and brain responses during differential cue and context fear conditioning, trait anxiety and anxiety sensitivity and, in addition to the daily stress levels, determined chronic stress and measures of acute stress including baseline and feedback cortisol levels and stress induced analgesia. Results: T-allele compared to AA-carriers with high versus low daily stress levels showed a significantly reduced response in the inferior frontal gyrus during early and an enhanced response in the amygdala during late cued fear acquisition. In addition, they displayed lower levels of trait anxiety, anxiety sensitivity, childhood trauma and chronic stress, which were also associated with daily stress levels. Conclusions: Our results indicate that current stress levels modulate the association between NPSR1 and fear and anxiety and thus suggest a prominent dependence of NPSR1-driven effects on environmental factors.

The brain neuropeptide S system as modulator of central stress regulation – insights from human genetic studies

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"Increasing evidence suggests that the brain neuropeptide S system is of major relevance for central stress regulation. In rodents, high expression of the NPS receptor (NPSR1) in the limbic system, distinct anxiolytic effects of exogenous NPS as well as extensive crosstalk between the NPS system and the hypothalamic-pituitary-adrenal (HPA) axis have been demonstrated. As to date NPSR1 antagonists for human pharmacological studies are not available, candidate gene studies are a useful approach to probe this system. In humans, associations between NPSR1 variants and anxiety and panic disorder, as well as amygdala responsiveness to fear-relevant faces have been reported. We performed a haplotype-based analysis covering three functional NPSR1 single nucleotide polymorphisms (rs2530547, rs324981, rs727162) in 277 healthy subjects who were exposed to the Trier Social Stress Test. A sex-specific association with salivary cortisol TSST responses was detected for the common haplotype 2 (frequency ~ 20%). In addition, a stress paradigm for scanner environments (‘ScanSTRESS’) was used for an imaging genetics approach. In 65 subjects, we found a significant and, again, sex-specific interaction between rs324981 (whose minor allele is harbored by haplotype 2) and the neural stress response in a cluster close to the parahippocampal gyrus. Moreover, preliminary evidence for a gene x environment interaction was found. In 42 subjects, a significant interaction between rs324981 and the environmental risk factor ‘urban upbringing’ modulating right amygdala responses was detected.

In summary, our findings suggest that NPSR1 sequence variants significantly influence acute stress regulation in humans, possibly in interaction with sex and environmental factors."

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In summary, our findings suggest that NPSR1 sequence variants significantly influence acute stress regulation in humans, possibly in interaction with sex and environmental factors."
More than just noise: Individual differences in fear acquisition, generalization and extinction

Tina B. Lonsdorf & Christian J. Merz
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Raum: A 9/10

“Why do only some individuals develop pathology following trauma or profit from treatment? Similarly, in experimental fear conditioning, pronounced individual differences are observed despite identical procedures. Traditionally, individual differences were regarded as ‘noise’ when interested in basic learning principles. Treating variance in data as ‘noise’ rather than data, however, deprives us from crucial insights into processes beyond the average. This symposium brings together results from a series of studies focusing on temperamental, developmental and biological individual differences in fear acquisition, fear generalization, and extinction. M. Andreatta reports how trait anxiety impacts safety learning via threat absence but not threat termination. This is complemented by T.B. Lonsdorf reporting a mediation of the influence of trait anxiety on individual differences in discriminating threat and safety via amygdala activation and a specificity of findings to trait anxiety beyond other measures of negative affect. J. Reinhard presents data from two large-scale studies on developmental correlates of fear learning and generalization by directly comparing different age children and adults. Finally, C.J. Merz provides recent data demonstrating interactive effects between sex and stress hormones during fear extinction in healthy participants as well as in patients with anxiety disorders. In sum, we tell a story from noise that steadily develops into a meaningful tune and converges into individual risk and resilience trajectories for pathological anxiety.”

Safety learning via threat absence and threat termination: Influences of trait anxiety

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Safety can be indicated by threat absence or threat termination (i.e., relief). Impaired safety learning has been proposed as risk factor for anxiety disorders. Here, we investigated the role of trait anxiety for both kinds of safety learning. Ninety-one participants underwent an acquisition phase during which one shape (threatCS) predicted a painful electric shock (unconditioned stimulus, US), one shape (reliefCS) followed the US, and one shape (absenceCS) became never associated with the US. In a following test phase, the three cues were presented again plus a control shape (controlCS). We found successful threat conditioning as threatCS was rated more aversive (negative, arousing, anxiogenic and associated with US) than the other cues, and it elicited startle potentiation as well as SCR. Safety cues were rated equally positive and (non-)anxiogenic, but less than controlCS, whereas physiologically reliefCS elicited stronger appetitive responses (startle attenuation and low SCR) than absenceCS. Interestingly, an increase in trait anxiety was associated with a decrease in the differences between absenceCS and threatCS responses reflected in contingency ratings during test. In sum, physiological but not verbal responses triggered by a relief signal compared to a threat-absence signal indicated that the former is more appetitive than the latter. Strikingly, trait anxiety specifically modulated learning of threat absence, but not of threat termination, indicating that high trait anxious individuals experience relief normally, but have deficits in experiencing safety.

Discriminating threat and danger signals during fear acquisition – Differential impact of trait anxiety, intolerance of uncertainty and neuroticism as well as mediation via amygdala activation

Lonsdorf, Tina B.
Universitätsklinikum Hamburg Eppendorf, Deutschland

Individual differences in fear learning are considered core mechanisms in the development/maintenance of affective disorders. Previous work linking measures of negative affect and fear conditioning provides evidence for a role of trait anxiety (TA), neuroticism (N) and intolerance of uncertainty (IUS) but the role of shared variance across these measures has not yet been investigated. Previous work investigating the role of TA on neural activation linked to fear conditioning is further limited by the investigation of neural activation without corresponding autonom ic/behavioral findings precluding mechanistic analyses. To fill these gaps, we present data from two independent studies. In study 1 (N=278), higher scores in TA, N and IUS were associated with reduced discrimination between threat and safety cues in skin conductance responses (SCRs) during fear acquisition in separate analyses. Path analyses considering all three measures however reveal a significant impact of TA only. In the second study (N=116), higher TA scores were again linked to reduced SCRs discrimination during fear learning. Path analyses and fMRI analyses link TA additionally to activation in brain regions critically involved in fear processing (amygdala, putamen, thalamus, primarily CS+–related). Moreover, a significant mediation effect of the impact of TA on SCR discrimination via the amygdala was observed. Our results suggest that trait anxiety is linked to discriminating threat and danger on
an autonomic level during fear learning and that amygdala activation partly mediates this link.

Developmental aspects of fear learning and fear generalization

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"Most research on human fear conditioning and fear generalization has focused on adults whereas only little is known about these processes in children. Direct comparisons between participants at different developmental stages are needed for better understanding developmental aspects of fear learning and its generalization. In a first study, we compared 267 children and 285 adults in a differential fear conditioning paradigm and generalization test. Skin conductance responses (SCR) and ratings of valence and arousal were obtained to indicate fear learning. Both groups displayed robust and similar differential conditioning on subjective and physiological levels. However, children showed heightened fear generalization compared to adults as indexed by higher arousal ratings and SCR to the generalization stimuli.

In a second study, we investigated developmental changes in fear conditioning and fear generalization in children aged 8 to 12 years. Therefore, we examined 473 healthy children with the fear conditioning paradigm and generalization test. Again, ratings of valence, arousal and SCR were obtained. All age groups showed comparable fear learning and fear generalization in valence and arousal ratings. However, SCR data indicated that children aged 12 years were better at discriminating CS+ from CS- compared to younger children. And this was true for children, who were aware that only the CS+ was followed by the UCS.

Modulation of fear extinction by sex and stress hormones: basics and clinical applications

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Institute of Cognitive Neuroscience, Department of Cognitive Psychology, Ruhr-University Bochum

The stress hormone cortisol crucially influences declarative learning and memory processes. On one side, cortisol reduces memory retrieval, while on the other side, it enhances memory consolidation. Both sides of the same coin open a wide range of possibilities of how stress hormones modulate other learning and memory processes such as fear extinction. In addition, stress hormones interact with sex hormones regarding their impact on emotional learning and memory processes opening a wide range of possible interventions to be considered in basic and clinical studies. In particular, anxiety disorders are thought to originate from learning experiences with higher prevalence rates in women. The standard psychotherapeutic treatment of anxiety disorders includes exposure therapy relying on the principles of extinction learning. Thus, it is highly relevant to understand the general framework of the interaction between extinction learning/exposure therapy, stress and sex hormones in order to make available treatment options for mental disorders more effective. This presentation will focus on recent data demonstrating these interactive effects in healthy participants as well as in patients with anxiety disorders. Altogether, future experiments should put emphasis on individual differences deriving from current stress hormone levels and sex to understand their critical influence on different emotional learning and memory processes. This line of research should eventually lead to more individualized and successful treatment approaches.

Klinische Anwendungsmöglichkeiten der funktionellen Nahinfrarotspektroskopie (fNIRS)

Thomas Dresler & Martin J. Herrmann
Universität Tübingen, Deutschland
Raum: A 8

"Die funktionelle Nahinfrarotspektroskopie (fNIRS) hat sich aufgrund technischer Fortschritte in den letzten zwei Jahrzehnten sowohl in der Grundlagen- als auch in der klinischen Forschung etabliert, moderne Auswertungsmethoden wurden eingeführt. In unserem Symposium werden wir auf aktuelle Entwicklungen eingehen und insbesondere die neueren Anwendungsmöglichkeiten dieser Methode darstellen.

Im ersten, das Symposium methodisch einleitenden Beitrag wird die Kombination von fNIRS mit simultaner Gleichstromstimulation (tDCS) während einer Wortflüssigkeitsaufgabe vorgestellt, woraus sich zukünftig ein potentieller Therapieansatz für verschiedene Gruppen psychiatrischer Patienten entwickeln dürfte. Ein Einsatz dieser methodischen Kombination bei Patienten mit Abhängigkeitserkrankung (Nikotinabhängigkeit) wird im zweiten Beitrag genauer aufgezeigt werden. Die Autoren gingen der Frage nach, inwiefern der Einsatz von tDCS zusätzliche Effekte zu einer Reizexpositionsbehandlung bietet und welchen Einfluss dies auf neuronale Aktivität und Konnektivität, gemessen mit fNIRS, hat. Im dritten Beitrag werden aufeinander aufbauende Studien vorgestellt, in denen die funktionelle Konnektivität kortikaler Netzwerke bei Patienten mit

Simultane fNIRS-tDCS Messung über dem präfrontalen Kortex
Herrmann, Martin J.; Horst, Anna K.; Löble, Sophia; Möll, Mira S.; Katzorke, Andrea; Polak, Thomas
Universitätsklinikum Würzburg, Deutschland

"Die funktionelle Nahinfrarotspektroskopie (fNIRS) stellt eine ausgezeichnete Methode dar, kortikale Aktivierung auch bei leichter Bewegung (z.B. beim Sprechen) zu erfassen und somit Defizite im Bereich der kognitiven Flexibilität bei psychiatrischen Patienten zu untersuchen. Gleichzeitig bietet fNIRS die Möglichkeit, kombinierte Messungen mit anderen Methoden ohne großen Aufwand durchzuführen.

Ziel dieser Studie war es, zu untersuchen, inwiefern die mit fNIRS gemessenen neuronalen Aktivierungen im präfrontalen Kortex (PFC) bei einer Aufgabe zur kognitiven Flexibilität (Wortflüssigkeitsaufgabe, VFT) durch eine gleichzeitige Gleichstromstimulation (tDCS) modulierbar sind und somit ein potentieller Therapieansatz für psychiatrische Patienten entwickelt werden könnte. Insgesamt wurden 61 gesunde junge Probanden eingeschlossen, die in drei Gruppen randomisiert wurden (links anodal / rechts kathodal vs. links kathodal / rechts anodal vs. Placebo). Die Probanden führten den phonematischen VFT durch während die präfrontale Aktivierung mittels fNIRS gemessen wurde. Gleichzeitig wurde der PFC mittels zwei tDCS Elektroden über den linken und rechten dorsolateralen PFC mit 1 mA stimuliert.

Die Ergebnisse zeigen eine signifikant erhöhte Aktivierung im frontotemporalen Kortex (FTC) nach links anodal / rechts kathodaler Stimulation im Vergleich zur Placebobedingung. Die Ergebnisse unterstützen die Hypothese, dass tDCS eine geeignete Methode darstellt, defizitäre neuronale Aktivierung zu modulieren, welche über fNIRS erfassbar sind."

Der Zusammenhang von Reizreaktivität und Exekutfunktionen – Einblicke aus der in vivo Exposition bei Rauchern und Implikationen für die Rückfallprävention bei Abhängigkeitsstörungen
Kroczek, Agnes; Haeussinger, Florian; Batra, Anil; Fallgatter, Andreas; Ehlis, Ann Christine
Klinik für Psychiatrie und Psychotherapie Tübingen, Deutschland


Veränderte Resting-State Konnektivität bei Depression – ein Korrelat depressiven Grübelns?
Rosenbaum, David; Fallgatter, Andreas J.; Ehlis, Ann Christine
Universitätsklinikum Tübingen, Deutschland

"Die Forschung zu neuronalen Grundlagen von Depressionen hat eine Vielzahl von Auffälligkeiten in neuronalen

In dieser Arbeit werden drei aufeinander aufbauende Studien vorgestellt, welche funktionale Konnektivität bei depressiven Patienten in den Fokus nehmen. Funktionale Konnektivität wurde mit funktionaler Nahinfrarotspektroskopie (fNIRS) untersucht. Unterschiede zwischen Gesunden und Patienten mit Depression wurden mittels Netzwerkbasierter Statistiken analysiert (Studie 1). Die depressionspezifischen Netzwerkdaten wurden anschließend auf Zusammenhänge mit state- und trait-Ruminationsprozessen untersucht (Studie 2). Um Unterschiede zwischen spontanen (resting-state) und induzierten Ruminationsprozessen zu untersuchen, verglichen wir die Prozesse in einem experimentellen Design (Studie 3).

Bei Patienten fanden sich verschiedene Abweichungen in der funktionale Konnektivität, was das Cognitive Control Netzwerk (CCN) und kortikale Regionen des Default Mode Netzwerks (DMN) umfasste. Ruminations erklärten diese Abweichungen in unterschiedlichem Ausmaß in Abhängigkeit davon, ob state- oder trait-Ruminationsprozesse betrachtet worden. Diese Ergebnisse werden kritisch diskutiert vor dem Hintergrund der vorhandenen Befunde zu Ruminationsprozessen bei Depression.

Neuronale Synchronizität von Eltern-Kind Dyaden während Kooperation

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Verglichen mit zufälligen Probandenpaaren fanden wir eine erhöhte Kohärentz bei Eltern-Kind Dyaden während des kooperativen Spiels im dorsolateralen präfrontalen Kortex (DLPFC, Kanal 8) und im frontoprafrontalen Kortex (FPC, Kanal 12). Darüber hinaus war die Kohärentz bei Eltern-Kind Kooperation in beiden Gehirnregionen stärker ausgeprägt als die Kohärentz bei Eltern-Kind Wettbewerb und Fremde-Kind Kooperation. In Bezug auf die kindliche Emotionsregulation stellten wir fest, dass eine niedrigere emotionale Labilität assoziiert war mit einer höheren Kohärentz bei Eltern-Kind Kooperation im FPC. Längsschnittliche Hyperscanning Studien wären erstrebenswert, um die Bedeutung der neuronalen Synchronizität mit der primären Bezugsperson für die kindliche Entwicklung zu untersuchen."
POSTERSESSIONS

POSTERSESSION DONNERSTAG
(POSTERNUMMERN 01 – 44)

DO 01
Are odors better than tones in cueing emotional memories?
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Odors were shown to be effective retrieval cues for memories obtained in emotional (Herz, 1997) and stressful situations (Wiemers, Sauvage, & Wolf, 2014). Compared to memories evoked by other sensory stimuli, odor-cued memories appear to be more emotional and vivid (Herz, 1998). Their strong potential to trigger memories of an emotional nature is commonly attributed to close interconnections of brain regions processing memory, emotion and olfaction. Despite a well-investigated relationship between olfaction and emotional information processing, research lacks systematic comparisons of the olfactory and other modalities regarding their ability to act as retrieval cues for emotional memories. We designed the current study to test whether there is a superiority of odors over auditory stimuli in cueing emotional memories. For this purpose, a picture recognition paradigm is applied with olfactory and auditory contextual cues and variations of the emotional character of the pictures to be remembered. On the first assessment day, participants are presented with 48 aversive and 48 neutral pictures together with either an odor or tone serving as contextual cue. The same pictures and an equal number of distractors are shown 24 hours later, either with the same, a different or without contextual cue. For each picture, participants state how certain they remember it from the day before. Results of this ongoing study concerning the recognition performance for emotional pictures using olfactory and auditory retrieval cues in men and women will be presented at the conference. They will help specify the unique role of olfactory cues for emotional memory.

DO 02
How retro-cues protect multiple working memory contents from interference: Evidence by event-related potentials of the EEG.
Anna Barth, Daniel Schneider
Leibniz Institut für Arbeitsforschung an der TU Dortmund, Deutschland

For the achievement of behavioral goals it is important to keep working memory updated and to avoid distraction by irrelevant information. Focusing attention within mnemonic representations is typically studied using retroactive cues (retro-cues). So far, neither the neural correlates of protection from interference nor the amount of information that can be protected by selective attention are well understood. We addressed these questions by running EEG during a visual working memory task based on retro-cues. Participants had to memorize the angle of three differently colored bars followed by one of four retro-cue types. Two selective retro-cues indicated a subset of the memory array as being relevant for report (one or two of three bars). In addition, two types of neutral cues were used: one cue repeated the color and position of all three bars; the other one was completely non-informative. A distractor display was presented during the retention interval in half of the experimental blocks. A distractor-induced performance decrease was only observed in neutral retro-cue trials whereas the presentation of selective retro-cues attenuated the distractor effects. Event-related potentials revealed a modulation of the negative slow wave over posterior electrodes, reflecting a release of cognitive resources due to selective retro-cues. Moreover, a P3b following the distractor was observed in neutral retro-cue conditions, indicating the encoding of the interfering information. This leads to the conclusion that selective retro-cues enable an optimization of cognitive resources allowing for the prevention of visual distractors from getting access to working memory.

DO 03
Die Auswirkungen von Stress auf den Gedächtnisabruf alltagsrelevanter Informationen
Lisa-Marie Stock, Christian J. Merz
Ruhr-Universität Bochum, Deutschland

alltagsrelevanter Informationen hin. Die beeinträchtigende Stresswirkung auf den Gedächtnisabbruch scheinen also in Abhängigkeit vom untersuchten Material zu stehen.

DO 04
On the contribution of motor planning to the retroactive cue benefit: Evidence by mu oscillatory activity in the EEG

Daniel Schneider, Anna Barth, Edmund Wascher
Leibniz-Institut für Arbeitsforschung an der TU Dortmund, Deutschland

Attention can be allocated toward mental representations in working memory also after the initial encoding of information has been completed. It was shown that focusing on only one item within working memory transfers this representation into a protected state, reducing its susceptibility to interference by incoming signals. The present study investigated the nature of this retroactive cue (retro-cue) benefit by means of a working memory task with a retro-cue indicating one, two or three memory representations as relevant and a block-wise distractor display presented after the retro-cue. On behavioral level, we found that the interfering effect of the distractor display on memory performance could be prevented when a retro-cue reduced working memory load. However, only the one-item retro-cue led to an overall increase in task performance compared to a condition without a retro-cue. The neural basis of this special representational status was investigated by means of oscillatory parameters in the EEG and a clustering approach on level of the independent components (ICs) in the signal. We found that an IC cluster representing oscillatory activity in the Mu range (10–12 Hz and 20–24 Hz) with a source in sensorimotor cortex revealed a power suppression following the retro-cue only in the one-item retro-cue condition. This suggests that the retro-cue benefit results in large parts from the possibility to focus attention on one particular item in working memory and initiate motor planning processes already ahead of the probe stimulus demanding the respective response.

DO 05
Latent toxoplasmosis alters reward modulation of cognitive control

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Latent infection with Toxoplasma gondii leads to behavioral changes due to an increase in dopaminergic signaling. Yet, virtually nothing is known about its effects on reward processing, even though this aspect of behavior is driven by dopamine. We therefore assessed behavior and event-related potentials in individuals with vs. without latent toxoplasmosis performing a rewarded control task. The data show that otherwise healthy young adults with latent toxoplasmosis show a greatly diminished response to monetary rewards as compared to their non-infected counterparts. While this selective effect eliminated a toxoplasmosis-induced speed advantage previously observed for non-rewarded behavior, Toxo-positive subjects could still be demonstrated to be superior to Toxo-negative subjects with respect to response accuracy. Event-related potential (ERP) and source localization analyses revealed that this advantage during rewarded behavior was based on increased allocation of processing resources reflected by larger visual late positive component (LPC) amplitudes based on activity changes in the right temporo-parietal junction (BA40) and left auditory cortex (BA41). Taken together, this suggests that the chronic increase in dopaminergic signaling found in latent toxoplasmosis boosts behavioral performance in challenging cognitive control situations but may at the same time reduce the sensitivity towards motivational effects of rewards.
kommen dieses Effektes. Die im Rahmen der Dresdner Burnout-Studie bereits initiierte, zweite Erhebungswelle der genannten psychischen und physiologischen Marker, wird die empirische Überprüfung eines kausalen Wirkungsmodells zwischen selbstregulatorischen Fähigkeiten und Burnout-Symptomatik ermöglichen.

**DO 07**

Emotions and steroid secretion in aging men: A multi-study report

Andreas Walther (1,2), Patricia Waldvogel (2), Emilou Noser (2), Jessica Ruppen (2), Ulrike Ehlert (2)

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Background: Aging increases the risk for cognitive and socioemotional deterioration. However, aging has been shown to be accompanied by a decrease in negative emotions. Steroid hormones and age-related alterations in secretion patterns have been suggested to play a crucial role in these age-related changes in emotion experience.

Methods: In three cross-sectional studies age-related differences in emotion experience and the moderating effects of steroid hormones were examined. Sample one consisted of 271 self-reporting healthy (SRH) men between 40 and 75 years, while sample two consisted of 121 men in the identical age-range but only including vital exhausted (VE) men. Sample three consisted of 625 men between 19 and 72 years reporting to have fathered (FA) one child.

Results: For all three samples negative associations were reported between age and anxiety and/or depressive symptoms. In addition, higher age was associated with lower levels of androgens but only for SRH-men with higher levels of cortisol. Modulating effects were identified for cortisol on the association between age and anxiety symptoms in SRH- and VE-men, while in VE-men trends emerged for testosterone on the association between age and depressive symptoms.

Conclusion: These results indicate cortisol to be a moderator of the association between age and symptoms of anxiety for healthy and VE-men, while only for VE-men moderating effects of testosterone on the association between age and symptoms of anxiety emerged. Age-related alterations in the hypothalamus-pituitary-adrenal/-gonadal axes emerge as promising avenues to investigate the decrease in experienced negative emotions in aging men.

**DO 08**

Hypnose ist nicht nur ein Rollenspiel: Vergleich von Hypnose und simulierter Hypnose bei Schmerz

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Vergangene Untersuchungen haben gezeigt, dass man unter Hypnose erfolgreich Schmerzunempfindlichkeit suggerieren kann. Was aber passiert, wenn die Probanden nur so tun, als seien sie hypnotisiert und würden die Schmerzreize nicht mehr fühlen?


Die Ergebnisse zeigen, dass die Amplitude der P260 sowohl unter Hypnose als auch in der Simulations-Bedingung im Vergleich zur Kontrollbedingung reduziert ist. Auch die Schmerzbewertungen sind in beiden experimentellen Bedingungen ähnlich niedrig. Da die Schmerzreize in der Simulationsbedingung bei erfolgreicher Simulation als schwächer bewertet werden als sie tatsächlich empfunden wurden, unterscheiden wir zwischen Probanden, die laut Nachbefragung tatsächlich schmerzempfinden, und denen, die die Schmerzempfindung unrealistisch bewerteten.

Hypnose und Simulation sind sich zwar auf den ersten Blick ähnlich hinsichtlich Schmerzempfindungen und ERP Antworten, jedoch war das Schmerzempfinden unter Hypnose tatsächlich reduziert, während es in der Simulations-Bedingung absichtlich als niedriger angegeben wurde, um den Anweisungen der Versuchsleiterin zu folgen. Wir vertreten deshalb die Ansicht, dass Hypnose ein spezifischer Zustand ist, der nicht durch eine bloße Rollenübernahme zu erklären ist, wie sozialpsychologische Theorien behaupten.

**DO 09**

Neuromodulation as a tool to induce olfactory and auditory source-monitoring deficits in healthy subjects

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Source-monitoring describes the process of determining the source of a percept as external (e.g. a sound, or smell), or internal (an imagined self-generated sound, or smell). Source-monitoring is affected by the similarity of perceived and imagined memories, with (pre-) supplementary motor area (SMA) having a crucial role in distinguishing between the two sources. In this study, we aim to inhibit the functionality of (pre-) SMA using cathodal (and sham) transcranial direct current stimulation (tDCS) in a group of healthy participants. By tDCS-induced transient neuromodulation we hope to introduce source-monitoring deficits in a source-monitoring task involving auditory (i.e. spoken words) and olfactory (i.e. smells) stimuli that are presented to the participant. We expect to find decreased SMA BOLD activation.
after cathodal tDCS application as well as behavioral indicators of source-monitoring deficits (i.e. ascribing the wrong source to a stimulus). A better understanding of the role of (pre-) SMA in the source-monitoring framework may enable to explain (and treat) hallucinations experienced by clinical populations, in which source-monitoring is known to be heavily compromised (i.e. paranoid schizophrenia).

Preliminary results suggest successful down-modulation of (pre-) SMA, as indicated by reduced levels of BOLD activation in participants that received 2mA of cathodal tDCS for 20min compared to a sham control group. These findings are supported by behavioral results that show a trend towards decreased source-monitoring performance of the tDCS group across both modalities. This suggests (pre-) SMA to be a promising candidate region within a source-monitoring network, that if impaired, leads to general source-monitoring deficits.

DO 10
Gammafunktionen und Ereigniskorrelierte Potentiale – Eine Methode zur Prüfung von Komponenten des Ereigniskorrelierten Potentials über der traditionellen Methoden hinaus

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DO 11
Neurophysiologische Mechanismen der circadianen Kognition

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The circadian variation of sensory and motor symptoms with increasing severity in the evening and at night is a key diagnostic feature / symptom of the restless legs syndrome (RLS). Even though many neurological diseases have shown a strong nexus between motor and cognitive symptoms, it has remained unclear whether cognitive performances of RLS patients decline in the evening and which neurophysiological mechanisms are affected by the circadian variation. In the current study, we examined daytime effects (morning vs. evening) on cognitive performance in RLS patients (n=33) compared to healthy controls (n=29) by analyzing flanker interference effects in combination with EEG and source localization techniques. RLS patients showed larger flanker interference effects in the evening than in the morning (p = .023), while healthy controls did not display a comparable circadian variation. In line with this, the neurophysiological data showed smaller N1 amplitudes in RLS patients compared to controls in the interfering task condition in the evening (p = .042), but not in the morning. The results demonstrate diurnal cognitive changes in RLS patients with intensified impairments in the evening. It seems that not all dopamine-regulated cognitive processes are altered in RLS and thus show daytime-dependent impairments. Instead, the daytime-related cognitive impairment emerges from attentional selection processes within the extra-striate visual cortex, but not from later cognitive processes such as conflict monitoring and response selection.

DO 12
DRINKING AGAINST PAIN? DOSE-DEPENDENT ALCOHOL EFFECTS ON PAIN PERCEPTION IN HEALTHY INDIVIDUALS USING STATIC AND DYNAMIC PAIN PARADIGMS

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Background and aims: Although alcohol is commonly believed to alleviate pain, experimental human research on pain-dampening alcohol effects is rare and limited to effects on pain threshold and
Response preparation and feedback processing - differences between ADHD subtypes

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Background

Patients with ADHD process information differently than children without ADHD. In this study we wanted to examine these different approaches of information processing in general and more specifically in relation to time estimation abilities. Furthermore, based on their different characteristics, the time estimation abilities of children with the predominantly inattentive (ADHDinatt) and the combined subtype of ADHD (ADHDcomb) will be compared.

Methods

Participants (17 ADHDcomb, 17 ADHDin & 17 controls) performed a time estimation task which required them to press a key 1200ms after a visual cue. Using high-density EEG recordings, we compared the visual P1/N1 (cue perception), the contingent negative variation (CNV) (motor preparation) and the feedback related negativity (FRN) (outcome evaluation) between the three groups.

Results

Behaviourally, all patients with ADHD responded prematurely more often than the controls. Neurophysiological analyses show no group differences in perceptual processes. The controls and the ADHDcomb group display a monophasic preparatory process. Controls have a steadily increasing CNV until the response. In ADHDcomb, this process is attenuated. In the ADHDinatt group this process is biphasic. The CNV initially increases just like in the control group, but then breaks down and only reoccurs immediately before the response. Feedback processing was also different in the ADHD groups with the FRN occurring significantly later in ADHDcomb.

Conclusion

The present findings show significant ADHD subgroup differences in response preparation and feedback processing despite similar behavioural performance. This indicates that additional hyperactivity/impulsivity symptoms are associated with qualitative differences in information processing.

DO 14

The effects of somatosensory lateral inhibition on motor inhibitory control - system neurophysiological study

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Motor inhibitory control is a central executive function, but only recently the importance of perceptual mechanisms for these processes has been focused. As such it is elusive in how far basic mechanisms governing sensory perception affect motor inhibitory control. One such basic principle is lateral inhibition. Here we examine whether sensory lateral inhibition processes modulate motor inhibitory control mechanisms using a system neurophysiological approach combining EEG signal decomposition with source localization methods in a somatosensory Go/Nogo task.

The results show that strong sensory lateral inhibition effects are associated with better motor inhibitory control. However, intra-individual variations in the strength of lateral inhibition effects do predominantly affect processes when information needs to be integrated between cerebral hemispheres. If information needs to be integrated between hemispheres, strong sensory suppression will lead to more impulsive errors. Importantly, the neurophysiological data suggest that not purely perceptual or motor processes are affected. Rather, effects of lateral inhibition affect the response selection level and seem to modulate processes of stimulus categorization associated with activity modulations in the posterior parietal cortex (PPC, BA7). The results suggest that when sensory suppression is high and when information needs to be integrated across hemispheres, these processes are less efficient, which likely leads to worse motor inhibitory control. The results show how basis principles modulating perceptual processes affect subsequent motor inhibitory control processes.
DO 15
Basal ganglia striosomes affect the modulation of conflicts by subliminal information – evidence from X-linked dystonia parkinsonism
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Cognitive control is required to cope with behavioral conflicts, induced by distracting information, which can emerge by consciously as well subliminally processed information. It is known that both sources of information interact, which suggests that they share common neural mechanisms. In the current study we investigated whether these interaction effects are modulated by microstructural basal ganglia dysfunction. In the early stages, patients with X-linked dystonia parkinsonism (XDP) typically show a selective deterioration of striatal striosomes. Therefore, XDP patients and healthy controls conducted a combined flanker and subliminal priming paradigm while recording an EEG. The interaction effects of conscious and subliminal processing were larger in XDP patients, emphasizing the importance of striosomal structures for cognitive control. This effect appears to be related to conflict monitoring and response selection processes, as indicated by N2 ERP modulations, involving the anterior cingulate cortex. Bottom-up perceptual gating and attentional selection processes, as indicated by P1/N1, as well as motor response activation processes, as indicated by LRP ERPs, were not affected. This suggests that the basal ganglia striosomes are critical for the processing of conscious and subliminal sources i.e. cognitive control processes.

DO 16
Distinguishing theta frequency stimulus and response codes in prefrontal areas during inhibitory control
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Response inhibition relies on a complex network of cortical and subcortical structures, including the superior frontal cortical areas like the supplementary motor area and inferior frontal areas. It is assumed that these areas play different roles in response inhibition, among others process different contents of information. In the current study we try to answer this question, by focusing on theta frequency band oscillations using a Go/Nogo task and combining different EEG signal decomposition and source reconstruction methods. The results suggest that stimulus coding may be gated by oscillations in the upper theta frequency band, while the lower frequency band may be important also for response selection during response inhibition. Importantly, the supplementary motor area appears to process both stimulus coding and response selection, while inferior frontal areas appear to be restricted to response selection only. The results indicate that different areas in the response inhibition network are important for different aspects of inhibitory control.

DO 17
Subkortikale und präfrontale Verarbeitung von Neurofeedback
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DO 18
Resource allocation in interruption processing: An age comparison
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In modern working environments the ability to multitask is often crucial for maintaining high task-performance. Multitasking heavily depends on cognitive functions like selective attention, task switching, and working memory. All of these functions were found to decline with increasing age. Against the background of an aging workforce it is therefore of special interest, whether the older employees’ performance is especially vulnerable when the primary task is interrupted by an unrelated task. We addressed this question by comparing the behavior as well as EEG measures of younger and older adults when performing in a nested task. For the primary task, participants had to memorize one of two sequentially presented stimuli while ignoring the other. In one third of the trials, this sequence was interrupted by a math task. The behavioral results show, that older adults’ performance was indeed more severely affected by interruptions, compared to younger adults. Additionally, older participants performed worse in the interruption task. Electrophysiological data suggests, that older participants made use of a different strategy for task processing compared to younger adults. Time-frequency decomposition revealed higher frontal midline theta power in older adults in response to trial onset. Theta power in younger adults was enhanced following the cue signaling an upcoming interruption. This result pattern indicates a more specific allocation of cognitive resources in younger adults to the interfering task. Older participants prioritized the primary task and failed accordingly when an interruption occurred.

DO 19
Shifts in the Functional Architecture of Cortico-Striatal
Resting State Connectivity in Alcohol Use Disorder
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A well-established organizational principle of the frontal cortex are parallel cortico-striatal-thalamo-cortical loops that are thought to constitute a spiraling hierarchy from reward over cognitive to motor systems. These systems have been consistently described in primate electrophysiology and human fMRI data, but the existence and relevance of interindividual differences in their functional architecture is unknown. Therefore, we used resting state fMRI in n=46 detoxified patients with alcohol use disorder (AUD) and n=37 healthy participants to assess the functional architecture of frontal-striatal connectivity as a major part of cortico-striatal-thalamo-cortical loops, and explore its association with AUD.

Analyses were conducted with MATLAB and SPM12. The functional images were preprocessed, and for each voxel in the frontal lobes the coordinates of maximal correlation in the striatum were detected. Afterwards, we applied a principle component analysis to find the most representative spatial axis, projected the coordinates of subject-specific voxel wise peak connectivity onto the first principal component, and entered these maps into SPM group comparisons.

At a liberal, exploratory threshold of p<0.005 unc., k=20, we identified the right anterior insula (rAI), right orbitofrontal cortex, and left BA44 as regions with shifted cortico-striatal connectivity in AUD. Striatal peak connectivity of the rAI was correlated with self-reported urge to drink alcohol in the AUD group (r=48, p<0.001).

These results suggest that alcohol use disorder is associated with shifts in the functional architecture of cortico-striatal connectivity and furthermore indicate a possible mechanism how the functional role of the rAI is altered in alcohol addiction.

DO 20
Die visuelle Mismatch Negativity ist sensitiv für die Position eines Reizes im visuellen Feld
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Die visuelle Mismatch Negativity (vMMN) spiegelt die automatische Verarbeitung von seltenen und unerwarteten Veränderungen in der visuellen Umwelt wieder. Im seriellen Oddball-Design kann die vMMN unter anderem durch eine kleine Veränderung der Position, an der ein relevanter visueller Stimulus präsentiert wird, ausgelöst werden. Offen ist allerdings, ob das auch gilt, wenn die Stimuli nur im rechten oder linken visuellen Halbfeld präsentiert werden. Um dies zu testen, haben zehn Vpn eine visuelle Klassifikationsaufgabe bearbeitet. Dazu wurden den Vpn Ziffern blockweise entweder im linken oder im rechten oder oberen Quadranten präsentiert. Die Aufgabe bestand darin, zu entscheiden, ob die Ziffer eine gerade oder ungerade Zahl ist. Zusätzlich wurde in 10% der Durchgänge die Ziffer leicht nach oben verschoben präsentiert; diese Veränderung war irrelevant für die Aufgabe. Die Positionsveränderung führte dennoch zu einer Verschlechterung der Leistung der Vpn, was nahelegt, dass die Position parallel mitverarbeitet wird und eine Veränderung automatisch detektiert wird. Dies spiegelt sich auch in den ereigniskorrelationierten Potentialen wieder: Unabhängig davon, ob die Stimuli im linken oder rechten Halbfeld präsentiert wurden, zeigt sich eine vMMN auf die seltenen und irrelevanten Positionsänderungen. Dies legt nahe, dass die Position im visuellen Feld auf der Ebene der sensorischen Verarbeitung kodiert wird und nicht etwa der Wechsel vom linken zum rechten Auge (oder umgekehrt) die vMMN auslöst.
DO 21
Punishment sensitivity is linked to tonic activity in the right dorsolateral prefrontal cortex
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Various models of personality include the assumption that basic temperament is governed by two motivational systems: an approach and an avoidance system. Their respective contribution most likely depends on reinforcement sensitivity, that is, the habitual responsivity to reward and/or punishment. Interestingly, one of the neurobiological substrates of reinforcement sensitivity appears to be a brain structure that has traditionally been implicated in cognitive control and executive processes: the dorsolateral prefrontal cortex (DLPFC). High sensitivity to threat and punishment is positively associated with tonic activity in the right-posterior DLPFC. In the present study, this finding was replicated and extended by means of resting-state electroencephalography (EEG) and source modeling (sLORETA). Our participants (N = 40) were awake and resting while neural activity was recorded for several minutes. For three different frequency bands that inversely reflect cortical activation (delta, theta, alpha-1), intracerebral activity in the right and left DLPFC was estimated. Confirming our prediction, we found that self-reported punishment sensitivity was selectively positively associated with tonic activation of the right DLPFC. The strength of this link was similar for female and male participants. Moreover, there was a trend toward a negative association between punishment sensitivity and tonic activation of the left DLPFC. Our findings corroborate the assumption that the DLPFC, as a hub for control functions, plays a key role in fundamental motivational processes and, thus, in personality. It might read out and inhibit basic affective signals, presumably regulating spontaneous approach or avoidance tendencies.

DO 22
A model-based cognitive neuroscience account of the chronometry of human decision making
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The integration of formal modeling of behavioral data and cognitive neuroscience has been described as model-based cognitive neuroscience (Forstmann et al., 2011). The main idea of model-based cognitive neuroscience is the simultaneous analysis of behavioral and brain data under the assumption that both measures reflect properties of the same latent cognitive process. This simultaneous analysis is typically achieved in a hierarchical Bayesian framework using formal mathematical models such as the diffusion model to constrain or inform inferences based on the brain data. The joint analysis of behavioral and neural data can be expanded into a cognitive latent variable model (CLVM) by including data from multiple conditions and/or tasks (Vandekerckhove, 2011). In addition to jointly modeling behavioral and neural data, a cognitive latent variable framework allows estimating correlations between higher-order latent variables, which reflect the covariance in behavioral and neural data across experimental tasks.

In the present study, we constructed CLVMs to assess the latent relationship between latencies of ERP components reflecting higher-order processing (P2, N2, P3) and behavioral data in three binary choice tasks. The latent drift rate parameter of the diffusion model was most strongly related to the shared variance between ERP latencies (i.e., the general speed of higher-order processing), but also showed specific associations with N2 and P3 latencies. Thes results support the notion that the buildup rate of a positive centroparietal potential may directly reflect the rate of evidence accumulation on a neural level (Kelley & O’Connell, 2013, O’Connell, Dockree & Kelley, 2012).

DO 23
Audio-visual integration in age-related hearing-loss
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Previous research provides compelling evidence for a cross-modal plastic reorganization following sensory deprivation, leading to an increased neural response to visual input in the auditory cortex. Recent animal and human data indicate that these changes can already be observed after a moderate hearing-impairment. However, the influence of the reduced auditory input on audio-visual interactions is largely unknown. Twenty participants with mild to moderate hearing-loss who do not yet wear a hearing-aid and twenty normal-hearing age-matched participants performed an audio-visual speech detection task in which they had to indicate which word was included in the previous sentence. Sentences were presented either audio-visually congruent, audio-visually incongruent, only visually or only auditory. Furthermore, the participants performed a working memory task, an audio-visual integration task quantified by the McGurk illusion, and a questionnaire for the hearing effort. Analysis of the data indicate significantly higher hearing effort and stronger audio-visual integration for the hearing-impaired subjects. Furthermore, hearing-loss was highly correlated with audio-visual integration with higher hearing-loss leading to stronger audio-visual integration. These results indicate that mild to moderate hearing-impaired subjects are more prone to incongruent audio-visual speech input than normal-hearing subjects, which may lead to an altered processing of audio-visual information. The speech detection task was implemented in a functional magnetic resonance imaging experiment. Neural data relating hearing-loss, audio-visual interactions and cross-modal reorganization of the auditory cortex are currently analysed.
DO 24
Emotional Modulation of Conflict Control Processes
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In order to efficiently adapt to an environment with competing stimulus response representations, conflict control processes are critical. Studies have shown that conflicting task–irrelevant emotional information can aggravate performance in an emotion classification task. The underlying neuro-functional system involved, and the specific impact of emotional valence on these conflict control processes, however, remain to be elucidated. We examined the behavioral and neurophysiological correlates of conflict processing arising from emotionally conflicting information, using an adaptation of the Emotional Stroop paradigm combining EEG-recordings with source localization analyses.

The results reliably replicate emotional Stroop-interference effects found in previous studies, as indexed by decreased response accuracy and slower reaction times on conflicting trials. Moreover, we show that the valence of emotions has to be taken into account, as the identification of negative emotions (i.e. angry and disgust) is more compromised by conflicting task-irrelevant emotional information than the classification of positive emotions. On a neurophysiological level this impact of conflicting information was, however, not reflected in early perceptual, attentional or conflict monitoring processes. Rather conflicting emotional information seems to compromise working memory updating (P3), thus aggravating and delaying the identification of task-relevant emotions. Moreover, it was shown that the identification of positive emotions was less impacted on by conflicting task-irrelevant emotional information, as was reflected in conflict-related slow potentials (and activity in middle frontal and superior frontal gyri). This may be due to the fact that the differentiation between negative emotions requires more processing capacity than the less challenging identification of the positive emotion.

DO 25
Neuronal intra-individual variability masks response selection differences between ADHD subtypes
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Due to the high intra-individual variability, which has been suggested to be endophenotype of ADHD, there may be a considerable bias in knowledge about altered neurophysiological processes underlying executive dysfunctions in patients with different ADHD subtypes. When aiming to establish dimensional cognitive-neurophysiological constructs of ADHD, it is crucial to consider such processes independent of variability.

We examined patients with the predominantly inattentive subtype (ADD) and the combined subtype of ADHD (ADHD-C) in a flanker task measuring conflict control. In addition to classic event-related potential (ERP) techniques and source localisation, neurophysiological (EEG) data was analyzed using residue iteration decomposition to eliminate the high intra-individual variability.

The analysis of classic ERPs related to conflict monitoring revealed no differences between patients with ADD and ADHD-C. However, when individual variability was accounted for, clear differences became apparent in the C-cluster (analogue to the P3 ERP-component). While patients with ADD distinguished between compatible and incompatible flanker trials early on, patients with ADHD-C seemed to rely more on automated response selection, through which they were able to reach the same behavioural outcome as patients with ADD. These differences are reflected in neuronal processes in inferior parietal areas.

The study demonstrates differences in neuronal mechanisms related to response selection processes between ADD and ADHD-C. Importantly, these differences could only be detected when accounting for intra-individual variability. The two groups differ in regards to the mechanisms connected to the accumulation of evidence when aiming to reach a decision about the response to be selected.

DO 26
Decoding retrieval success and memory content during short-term memory maintenance
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In his search for the physical substrate of long-term memory in the brain, Semon proposed that, apart from coding the particular content of a learning episode, an engram should enable correct memory retrieval. Using multivariate pattern classification, we tested whether electrical brain activity recorded during short-term memory maintenance satisfies these conditions, and where identified short-term memory representations reside. In our experiment, participants learned two short-term memory tasks, encoding either pictures of faces or houses, or sequences of digits or letters. Brain activity was recorded using EEG. It was possible to decode retrieval success from electrical brain activity during the delay period of both short-term memory tasks. Moreover, we could distinguish whether participants kept pictures of faces or houses in memory, and classifier performance on this problem correlated with successful memory maintenance. Using spatial as well as frequency band-based searchlight analyses, we found that distinct brain areas and frequency bands coded for the success versus the content of short-term memory. Frontal and parietal higher frequency bands and alpha activity predicted retrieval success, whereas memory content was represented in temporal and parietal higher frequency ranges, as well as theta activity. We propose that frontal cortex supports memory-related control processes, whereas temporal cortex shows a sensory reinstatement of material content and is part of the wider activated network during memory retention. Interestingly, the only overlap between electrodes coding for retrieval success and memory content
DO 27
Acute laboratory and real-life stress – consistency and specificity across response domains
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The Trier Social Stress Test is a valid protocol to induce stress under laboratory conditions. Despite its popularity, few attempts were made to explore the ecological validity of the TSST. In our study, 31 subjects (24 females) were exposed to the TSST before completing an oral exam on a separate weekday. Cortisol levels increased significantly in response to both stimuli (TSST: F(2.21, 66.33) = 5.73, p = .004; exam: F(1.98, 59.28) = 4.38, p = .017) with similar response curves and correlations between cortisol increases and areas under the curves (increase: r = .67; AUC: r = .56; both p ≤ .01).

Consistently, heart rate responses (subgroup with N = 15, 12 females) were also significantly associated (increase: r = .76; p ≤ .01; AUC: r = .56; p ≤ .05) while different time course dynamics (F(2.48, 29.74) = 4.34, p = .02) suggested a somewhat lower stress load during the exam.

Significant correlations were also found for affect changes (increase: positive affect: r = .36; negative affect: r = .50; both p ≤ .05; AUC: positive affect: r = .81; negative affect: r = .70; both p ≤ .01) but response curves differed markedly (positive affect: F(2.55, 76.60) = 10.15, p < .001; negative affect: F(1.56, 46.82) = 23.32, p < .001) indicating a more pronounced affect response to the exam. Our findings suggest remarkably consistent associations between reactions to our laboratory and real-life stress, while, at the same time, response patterns differed, particularly between biological and affect responses.

DO 28
Attentional processing during instructed deception: Effects on behavior and event-related potentials and their use in an individual detection of the critical items
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Based on the idea that deceptive responding deviates from a default mode of telling the truth, we predicted enhanced attentional processing of items triggering a deceptive response, compared to standard items. In Experiment 1, 20 participants repeatedly categorized five each visually presented animal and plant names. However, one name of each category had to be responded deceptively. For these critical items we found significant increases in response time (RT) and error percent, along with greater amplitudes of P3a, medial-frontal negativity (MFN) and posterior P3b in the event-related potential (ERP). In a blind detection of the individual critical items, an item was classified as conspicuous if two of the four measures RT, error percent, MFN-P3a difference amplitude, and P3b scored more than 1.5 standard deviations above the mean of the remaining four items. With its sensitivity (0.73) and specificity (0.95), this combined-measures algorithm outperformed a chance detection (0.2/0.2), as well as an algorithm based on RT alone. In Experiment 2 using a furniture/clothing categorization, behavioral and ERP deception effects were replicated in 25 new participants, with only slight adjustments made to the ERP time windows. Again, the two-out-of-four criterion (RT, errors, MFN-P3a difference, P3b) showed excellent detection performance of the critical items (sensitivity 0.88, specificity 0.94). Findings indicate that deception involves attentional processes beyond cognitive control, that is, enhanced orienting to, and deeper encoding of, the critical items as reflected in P3a and P3b, respectively. Furthermore, detection of deceptive responses benefits from a combination of behavioral and ERP measures.
keit bzw. hohen versus niedrigen Gewinnbeträgen wählten im Vergleich zur SHAM.

Die Ergebnisse der vorliegenden Studie sprechen dafür, dass anodale tDCS Stimulation des linken dPFC die Annäherungsmotivation gesunder Teilnehmer in Abhängigkeit der Eigenschaften der potentiell Belohnungen erhöht und dass sich linksfrontale kortikale Aktivierung kausal auf Annäherungsmotivation auswirkt. Die relative Verschiebung der Anstrengungsbereitschaft der Probanden hin zu Belohnungen mit geringer Gewinnwahrscheinlichkeit und hohen Gewinnbeträgen spricht dabei für eine spezifisch erhöhte Annäherungsmotivation.

DO 30
Tracking representational similarity and oscillatory correlates of selective rehearsal and active inhibition in a directed forgetting paradigm

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An essential mechanism in memory is to selectively process memory representations depending on their relevance for achieving current cognitive and motivational goals. Despite a long history of research, it is unclear whether this is achieved through the selective rehearsal of relevant items or the active inhibition of irrelevant items. We studied this question by applying multivariate analysis methods to EEG data to track item-specific representation in the EEG during an item-method directed forgetting paradigm.

During encoding, pictures of everyday objects were followed by a cue indicating whether an item needs to be remembered (R cue) or can be forgotten (F cue). In line with previous studies memory performance for F-cued items was significantly lower than for R-cued items. To elucidate whether this difference in memory performance is related to rehearsal, inhibition or both, item-specific representations were contrasted during R and F cues. Initially, 500-1000ms post cue, item-specific representations were significantly reduced for voluntarily forgotten F-cued items in contrast to non-voluntarily forgotten R-cued items. This downregulation of item representations during voluntary forgetting concurred with increases of alpha power during F cues contrasted to R cues, possibly reflecting the inhibition of item specific representations. In a later time window, 1500-2000ms post cue, neural signatures of voluntarily remembered R-cued items increased in contrast to involuntarily remembered F-cued items, indicating the selective rehearsal and enhancement of desired memory representations.

The current results show that memory representations can voluntarily be up- or downregulated by the sequential employment of active inhibition and selective rehearsal mechanisms.

DO 31
The neural signature of memory intrusions

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Memory intrusions are a hallmark symptom of various psychiatric conditions, most notably posttraumatic stress disorder. Employing electroencephalography (EEG), the present study set out to investigate what distinguishes involuntary intrusions from intentional retrieval of desired memory representations.

We contrasted neural activity between two subsequent experimental phases, an intentional retrieval and a visual discrimination task. Both tasks utilized the same stimulus material consisting of pairs of centrally presented abstract cues and pictures of everyday objects presented in the left or right visual hemifield as targets. During intentional retrieval, participants engaged in item recognition on the cues and were instructed to remember the targets and their respective hemifield of presentation. During visual discrimination, cues were presented in an identical manner, but participants now completed a speeded visual discrimination task, subsequently indicating involuntary intrusion of the target.

Voluntary retrieval was characterized by an increase of brain oscillatory power at theta (5–9 Hz) frequency at parietal and frontal electrodes in a time window from 700–1200 ms, consistent with recollection and post-retrieval monitoring. In contrast, involuntary intrusions led to prolonged reaction times in the discrimination task and an early (200–700 ms) frontocentral theta power increase, supposedly signaling interference of unwanted memory representations.

These results suggest that memory intrusions trigger an early interference signal but are not followed by indices of recollection and post-retrieval processing observed in voluntary retrieval. These insights could aid the development of novel therapeutic techniques such as the modulation of theta power by means of brain stimulation in service of controlling involuntary memories.

DO 32
THETA-GAMMA CROSS-FREQUENCY COUPLING: A MARKER FOR THE DEEPNESS OF HYPNOSIS?

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The neuronal dissociation hypothesis states, that hypnosis is an altered state of consciousness caused by a decoupling of brain areas, which are coupled under normal conditions. Support for this hypothesis is mainly provided by studies on pain, showing reductions in gamma coherence under hypnosis. Theta activity typically increases during hypnosis compared to control conditions in participants suggestible for hypnosis. Similar increases have been reported for gamma activity, although less consistently. A possible explanation for the inconsistency in gamma-related findings is that not gamma activity per se, but its coupling to theta is associated with hypnosis. Based on the neuronal dissociation hypothesis, we hypothesize that
the strength of theta-gamma phase-amplitude coupling should decrease during the state of hypnosis in high suggestible subjects. We tested this hypothesis in two independent data sets, each consisting of groups of high and low suggestible subjects. The hypnosis consisted of a standard induction procedure, followed by suggestions to imagine a fish swimming deeper and deeper in the water. Previous results have shown that these suggestions are capable of prolonging later periods of slow-wave sleep (SWS). Preliminary results show that during the hypnosis, theta-gamma phase-amplitude coupling is present in all subjects, although to a lesser extend during hypnosis compared to the control condition in high suggestible subjects. In accordance with the predictions of the neuronal dissociation hypothesis, theta-gamma coupling might indicate deepness of hypnosis and might be related to the success of hypnotic induction and suggestions.

DO 33
Temporal dissociation of the bed nucleus of the stria terminalis and amygdala during threat anticipation in patients suffering from Generalized Anxiety Disorder

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Sustained anticipatory anxiety is a core symptom in Generalized Anxiety Disorder (GAD) and facilitates its development and maintenance. Influential neurobiological models propose a specific role for the bed nucleus of the stria terminalis (BNST) in sustained responses to threat, while phasic responses are associated with amygdala activity. It has been hypothesized that sustained anticipatory anxiety in GAD patients may be linked to alterations in BNST activity, but to date, no firm evidence was reported yet. The present study aimed to disentangle phasic and sustained responses during threat anticipation in GAD patients relative to healthy controls (HC). Participants underwent functional magnetic resonance imaging during a temporally unpredictable threat anticipation paradigm. We implemented phasic and a systematic variation of sustained response models for blood oxygen level-dependent responses during threat anticipation, to disentangle temporarily dissociable involvement of BNST and amygdala. GAD patients relative to HC responded to threat minus neutral anticipation with elevated phasic amygdala and with delayed-sustained BNST activity. Our findings suggest that both amygdala and BNST show altered responses in GAD during threat anticipation, albeit with different time courses. All findings survived strong statistical criteria based on permutation test statistics. Especially the BNST findings underline for the first time the role of the BNST in sustained response to threat in GAD, and contribute to a deeper understanding of pathological anticipatory anxiety in GAD.

DO 34
Exogenous cortisol boosts risky decision-making in men but not in women

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Acute stress has been repeatedly shown to impact risky decision-making, yet differently in men and women. While stress enhances risk-taking in men, no such effects or even reduced risk-taking have been reported in women after stress. The impact of stress on risky decision-making has been linked to the stress-induced rise in cortisol. Yet, whether elevated cortisol is indeed sufficient to modulate risk-taking, whether its impact on risk-taking behavior is comparable in men and women, and whether cortisol exerts its effects on risk-taking in interaction with noradrenaline is currently unknown. To address these questions, healthy men and women received orally either a placebo, hydrocortisone, yohimbine, an alpha-2-adrenoceptor-antagonist leading to increased noradrenergic stimulation, or both drugs before completing a validated measure of risk-taking behavior, the balloon analogue risk task. Our results showed that cortisol triggered increased risk-taking in men but not in women. While increased noradrenergic stimulation after yohimbine intake did not modulate the impact of cortisol on risk-taking behavior, yohimbine administration tended even to reduce risky decision-making, both in men and women. These findings show a causal influence of cortisol on risk-taking behavior in men but not in women, pointing to cortisol as the driving force in the gender-specific impact of stress on risk-taking.

DO 35
Empathy and social decision making in long-term MDMA users.

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3,4-Methylenedioxyxymethamphetamine (MDMA) is the prototypical prosocial drug inducing enhanced empathy, increased prosocial feelings, and a general sense of well-being. While research on the acute effects on empathy suggests that MDMA enhances emotional and decreases cognitive empathy, the long-term effects of MDMA use on social cognition have not been investigated. Therefore, we examined emotional and cognitive empathy and social decision making in MDMA users. We tested 38 main MDMA users and 56
DO 36
Contrasting error/correct-related negativities in traditional discrete task (flanker task) and continuous task (force production task)

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To date, human action monitoring studies mostly employed tasks involving discrete response parameters (i.e., left and right hand response in a two-choice flanker task). Here, we investigated whether the error/correct-related negativity (Ne/ERN or CRN) show the same patterns in a continuous task (force production task) as in the traditional discrete task (flanker task). While the observed components in both tasks were pretty much the same, we hypothesized that error processing should be more difficult for continuous response parameters such as force or time, compared to a hand error. A total of 33 participants were tested individually in two sequential experimental sessions. The participants performed successively a modified version of an Eriksen-Flanker and a force production task. In the first session, participants were asked to decide if the central digit was even or odd with either their left or right index finger. In the second session, participants were required to produce a brisk, short-lasting isometric force pulses with their right index finger, which amounts to 46% to 54% of their Maximum Voluntary Force (MVF). We contrasted the ERP components (Ne/ERN and CRN) for correct and incorrect hand errors and correct and incorrect force production errors. In term of topographic distributions, we found similarities and dissimilarities between the two tasks during the time course of 50 – 100 ms after response onset. Our results also revealed larger CRN but smaller Ne/ERN for the force task, which can be explained by a higher response uncertainty in the force task.

DO 37
Single-session tDCS impacts upon response interference

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The present study examined the role of the left dorsolateral prefrontal cortex (DLPFC) in response interference as for example measured in the Stroop task. Neuropsychological research has shown that interference typically leads to an increase of activation in the left DLPFC. By using transcranial direct current stimulation (tDCS) we investigated the performance in a two color-word Stroop task. After a baseline (Stroop pretest), neural activation of left DLPFC was either excited (anodal stimulation) or inhibited (cathodal stimulation). The stimulation period was followed by another identical task (Stroop posttest). Error data showed a larger Stroop effect only in the cathodal stimulation condition in the posttest. This effect was mainly driven by an increase of the error rate in the incongruent condition. We interpret this finding as evidence for increased interference due to tDCS induced inhibition of the left DLPFC. Our results thus confirm the impact of the DLPFC in response interference by neural modulation as well as the impact of single-session tDCS upon cognitive processes.

DO 38
Lasting Emotion Processing Deficits in Dependent Marijuana Users after 28-days of Abstinence

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Intact emotional functioning is vital for the long-term success of addiction treatment strategies, including marijuana addiction. Previous studies reported altered emotion processing in chronic marijuana users after short abstinence periods (<2 days) suggesting residual effects on emotional brain functions. However, due to the short abstinence periods long-term effects of use remain to be determined. To this end, the present fMRI study examined emotion processing in marijuana dependent subjects (n = 21) and carefully matched non-using controls (n = 20) after an abstinence period of >28 days. Relative to healthy non-using control subjects, marijuana dependent subjects demonstrated increased medial orbitofrontal cortex activity and stronger functional coupling of this region with the dorsal striatum during processing of negative stimuli. A confirmatory analysis of resting state fMRI connectivity revealed increased functional coupling of this pathway at rest in marijuana users. In contrast, neural activity during processing of positive stimuli and the subjective emotional experience in terms of valence and arousal were comparable in both groups.
Together, our findings provide the first evidence that marijuana dependence is associated with lasting valence-specific deficits in emotion processing of negative stimuli that may arise from general impairments in orbitofrontal cortex function.

DO 39

NRSN1 associated grey matter volume of the visual word form area reveals dyslexia before school

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Learning how to read and spell requires the brain to reorganize in response to environmental influences. At the same time, literacy skills are heritable and thus to some degree genetically predetermined. Here we related 19 literacy-associated genes to gray and white matter volumes derived by voxel-based morphometry in a cohort of 141 children ranging from 3 to 12 years of age. Subsequently, a sample of 34 children attending grades 4 to 8, and another sample of 20 children, longitudinally followed from kindergarten to first grade, was separated into dyslexics and controls using linear binary support vector machines. Age, gender, handedness, non-verbal IQ and parental education were included as covariates of no interest in the models.

The gray matter volume of the "visual word form area" (VWFA) was found to be related to NRSN1, a gene assumed to regulate neurite formation. Moreover, the NRSN1-associated cluster in the VWFA distinguished dyslexics and controls not only after several years of schooling (classification accuracy: 73.53%, p = 0.031, family-wise error-corrected), but also already at a kindergarten age before literacy instruction had actually begun (classification accuracy: 75%, p = 0.035, family-wise error-corrected).

These findings (published in the journal Brain) shed new light on the "nature and nurture" of literacy acquisition. We have shown that there seems to be a genetic limit to the "nature and nurture" of literacy acquisition. We have shown that there seems to be a genetic limit to that. Recently, we have shown that there seems to be a genetic limit to that. Additionally, we were interested in the impact of sleep on both functional and structural changes. In a day-wake, night-sleep design two groups of subjects (n=41) learned object-place associations over eight learning-recall repetitions in two sessions spaced 13 hours apart. Neural activity during learning and recall was measured with fMRI. To assess structural changes, we acquired diffusion weighted images at three time points: immediately before the first learning session, 90 minutes after the first learning session and again before the second learning session, after a day of waking or a night of sleep. In line with the results on functional brain activity, mean diffusivity in the gray matter of the visual word form area reveals dyslexia before school.
the PPC decreases after learning, which has been suggested as a marker for long-term potentiation. The simultaneous investigation of functional and structural changes confirms the rapid build-up of a long-term memory representation in the neocortex, which is further stabilized by sleep. The contribution of the hippocampus to encoding, however, seems to be confined to the very first encounter with new information.

DO 42
Ablenkbarkeit durch sexuelle Reize – ein biologischer Marker der Hyposexualität?

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Erste Analysen zeigen, dass die Reaktionszeiten in der Linienorientierungsaufgabe bei Bildern mit sexuellem Inhalt im Vergleich zur neutralen Bedingung verlangsamt waren. Im Gegensatz dazu hatten die allgemeine sexuelle Motivation und sexuell sündiges Verhalten nur einen kleinen oder gar keinen Effekt auf die Reaktionszeiten. Das neuronale Aktivierungsmuster unterschied sich zwischen den Bedingungen und je nach Bildinhalt, während Geschlecht, sexuelle Motivation und/oder sexuell sündiges Verhalten nur einen geringen Effekt hatte.

Entgegen unserer Annahmen scheint die Ablenkbarkeit durch sexuelle Reize keine herausragende Rolle bei der Entstehung sexuell sündigen Verhaltens zu spielen. Dies scheint durch einen Deckeneffekt erklä- rbar: Sexuelle Reize binden allgemein viel Aufmerksamkeit, unabhängig von der allgemeinen sexuellen Motivation oder sexuell sündigem Verhalten.

DO 43
Space- and object-based attention are reflected by different components of the steady-state visual evoked potential

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Attentional selection facilitates processing of perceptual stimuli in different ways. While space-based attention enhances processing at a spatially cued location, object-based attention means that attending one aspect of an object enhances processing of the entire object. It has remained unclear, however, to which extent space- and object-based attention rely on the same or different neural mechanisms. To address this question, in our experiment we presented randomly moving dots within the outlines of two objects. Importantly, the dots flickered at one of six distinct frequencies in the range of 26.25-47.5 Hz in order to frequency-tag six different locations along the two objects. Participants were cued to attend a location of one of the two visual objects and perform a dot motion detection task. We used EEG steady-state visual evoked potentials (SSVEP) evoked by the flickering, randomly moving dots to measure neural responses to three spatial locations each on the attended and unattended object. We observed a sustained enhancement of the amplitude and the inter-trial phase coherence (ITPC) of the first SSVEP harmonic only at the spatially cued location. In contrast, an uncued location on the same object as compared to an equidistant location on the different object showed a transient ITPC increase, but specifically of the second SSVEP harmonic. These results suggest that different components of the SSVEP differentiate between space- and object-based attention, indicating different neural underpinnings.

DO 44
Diverging influences of sleep on subjective and physiological emotional reactivity in children

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Children report a higher occurrence of both nightmares and night terrors compared to adults. What is more, children also exhibit more slow wave sleep and rapid eye movement sleep, both of which have been linked to the processing of emotional memories. Here, we asked how sleep in school-age children (8-11 years, n = 14) is related to their ability to cope with emotional memories using a within-subjects delayed recognition paradigm. During the encoding session children were presented with 72 negative and 72 neutral images. Following each image, children were asked to rate their emotional response in terms of valence and arousal. After a delay period (~10 hours of either wake or sleep), participants were presented with the originally encoded images as well as 36 negative and 36 neutral distractor images. The children were again asked to rate each image, as well as report whether or not they had seen it during encoding. At all ses-
sions, heart rate and electroencephalographic (EEG) activity were measured. Emotional reactivity (i.e. the difference in emotional response for negative compared to neutral images) for images at encoding was then compared to emotional reactivity for successfully remembered images at recognition. Our findings suggest sleep leads to a decrease in emotional reactivity as measured by subjective ratings of valence, but to preservation of emotional reactivity as measured by heart rate deceleration and the late positive potential of the EEG. Though preliminary, these results suggest that sleep in children may influence physical and mental aspects of emotion differently.

POSTERSESSION DONNERSTAG
(POSTERNUMMERN 45 – 88)

DO 45
Experiences in Virtual Reality: A Window to Autobiographical Memory
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Virtual Reality (VR)-based paradigms could substantially increase the ecological validity of various psychological research topics as VR allows submerging into real-life experiences under controlled laboratory conditions. In particular, in the field of mnemonic research, concerns have been raised that “laboratory memory” differs significantly from “real-life” autobiographical memory. An event in VR is characterized by personal relevance and self-involvement, which implies richer content and more elaborate associative networks. As a consequence autobiographical traces are formed. Our study aimed to assess the immersive qualities of VR not only upon application but – more importantly – during the retrieval of the virtual experiences subsequent to a VR session. We presented the participants either a 360° VR or a 2D Video of a motorcycle ride followed by an unannounced recognition memory task 48 hours later. The participants in the VR-group achieved superior results in the memory task. Their reaction times were found to be delayed. Based on reaction time and retrieval success as valid indicators for the profundness of memory traces, we assume that autobiographical memory and episodic memory vary as a function of immersion during the encoding of identical visual experiences. Furthermore, in the VR-group the participants’ mood after the presentation of the 360°VR affected the memory consolidation process. These findings indicate that immersive VR experiences become part of a profound autobiographical associative network, whereas the conventional video experience remains an isolated episodic event.

DO 46
Twice the paradigm, double the result! Replicated frontal brain activation patterns and behavior in a virtual T-maze
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Frontal asymmetry is still discussed concerning the theoretical constructs leading to the phenomenon. The original theory of Davidson and the specification by Harmon – Jones & Allen allocated approach motivation to relative left anterior brain activation and withdrawal motivation to relative right anterior brain activation. Hewig and colleagues extended this theory by adding a bilateral frontal activation representing a biological correlate of the behavioral activation system (BAS) and behavior. Wacker and colleagues theorized that relative left frontal brain activation stands for behavior, while relative right frontal brain activation stands for behavioral inhibition and the experience of conflict. These theories were investigated in a state based approach with a paradigm where virtual behavior and brain activation was measured simultaneously.

In an attempt to replicate and extend a first study using 30 participants, we used a slightly modified paradigm and examined 56 participants who explored a virtual T-maze in a desktop virtual reality paradigm.

Analyzing the influence of frontal brain activation measured via EEG during the cueing phase of different events on the observed behavior, we found in both studies an influence of frontal asymmetry on the resulting behavioral categories shown in the paradigm. Additionally there was more bilateral frontal brain activation (lower bilateral frontal alpha activation) when participants were engaged in behavior compared to doing nothing during a trial in both studies.

The studies provide evidence for an approach-withdrawal model of frontal asymmetry and a bilateral BAS model, where frontal asymmetry stands for behavioral motivation and bilateral frontal activation for behavior.

DO 47
Zum Einfluss des OXTR-Polymorphismus rs2268498 auf den Attentional Bias bei Betrachtung emotional valenter Bilder
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Oxytozin (OT), ein im Hypothalamus synthetisiertes Nonapeptid mit hormoneller und neurotransmissiver Wirkung, wird neben reproduktionsbezogen-physiologischen Phänomenen v.a. mit der Regulation von Sozialverhalten in Verbindung gebracht. Applikationsstudien zeigen beim Menschen u.a. Einfluss auf Bindungsverhalten, Spielent- scheidungen in quasikonomischen Paradigmen, Verarbeitung und Wiederabruf sozialer Reize sowie die Intensität sozialer Interaktion. Während die Administration exogenen OTs zweifellos wichtige Erkenntnisse über die Wirkungsweise des Peptids verspricht, ist die biologische Grundlage interindividueller Unterschiede in der Verarbei-
tung sozialer Reize im endogenen OT-System zu vermuten, dessen differenzielle Aktivität u.a. durch Variationen auf dem OT und Oxytozinrezeptor (OXTR-) Gen bedingt ist. Fraglich ist zudem, ob die OT-Effekte ausschließlich auf die Modulation höherer Evaluations- und Bewertungsprozesse zurückgehen, oder ob bereits frühe Phasen der Stimulussignalverarbeitung moduliert werden.

Um dies zu überprüfen unterzogen wir N = 165 Personen einer Dot Probe Task mit emotionalen IAPS Bildern und berechneten den Attentional Bias für negative und positive Stimuli. Außerdem wurden alle Probanden für den rs2268498 Oxytozinrezeptorpolymorphismus genotyptisiert.

Es zeigte sich, dass Träger des T-Allels in beiden Bedingungen einen kleineren Bias aufwiesen, wohingegen Träger des C-Allels mit einer stärkeren Zuwendung zu negativen Reizen und einer stärkeren Abwendung von positiven Reizen einen größeren Attentional Bias zeigten.

Diese Ergebnisse legen in Einklang mit vorangegangenen Befunden eine Modulation früher Phasen der Verarbeitung emotionaler Stimuli durch den Polymorphismus nahe. In früheren Studien gefundenene Unterschiede in komplexen Konstrukten wie Empathie, interpersonalen Vertrauen, Ängstlichkeit und prosozialen Tendenzen in Abhängigkeit von der Ausprägung des rs2268498 könnten sich zumindest teilweise auf diese Modulation zurückführen lassen.

DO 48

Contexts will tear us apart again: Virtuelle furchtkonditionierte Kontexte modulieren das Late Positive Potential von Gesichtern

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DO 49

Parameters of sleep and experimental pain and their relationship in patients with chronic musculoskeletal pain and healthy controls

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Both alterations in the pain system and sleep disruptions are common in patients with chronic musculoskeletal pain, but to date there is little known about the relationship between sleep and experimental pain in this patient group. Therefore this study aims at examining objective and subjective sleep parameters as well as parameters of experimental pain (pressure pain threshold, temporal summation, pain inhibition, pain catastrophizing). Additionally we aim to examine, whether sleep parameters can predict overnight-changes in pain sensitivity.

Until now 17 pain patients and 17 healthy controls (out of intended 20) were studied. Sleep was polysomnographically assessed during two non-consecutive nights. Pain testing (conditioned pain modulation- / CPM paradigm) was conducted the evening before and the morning after each night.

Results show worse sleep in patients according to objective (total sleep time, sleep efficiency, sleep onset latency, duration of awakenings and rREM stage 2) and subjective sleep parameters (restfulness), lower pain thresholds, enhanced pain catastrophizing and an impaired CPM. Hierarchical regression analyses with sleep parameters as predictors were calculated to predict overnight pain changes, but none reached statistical significance. This study suggests that sleep in pain patients differs from healthy subjects’ sleep according to overall sleep-related parameters, rather than sleep-stage-specific parameters. Results concerning parameters of experimental pain were in line with previous findings. Despite group differences the relationship between regular sleep and experimental pain can be questioned, for sleep parameters lacking predictive value for overnight pain changes. Future research should therefore determine if a relationship becomes present after experimental disruption of sleep.

DO 50

Optimism and pain perception - the influence of optimism on the experience and the expression of pain

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Background: There’s much evidence of the role of optimism as a resilience factor. In the pain context, numerous clinical and experi-
mental studies have shown significant negative correlations between optimism and pain experience. The Best-Possible-Self technique has been proven successful in inducing situational optimism. It has never been systematically examined whether optimism modifies the communication (e.g., the facial expression) of pain.

Aims: In an experimental setting, a temporarily more optimistic state should be induced to examine the impact of optimism on the experience and on the facial expression of pain.

Methods: Forty participants underwent two painful thermal stimulations on the forearm. In between, the experimental manipulation, an imagery and writing task, was applied. While one half of the participants performed the Best-Possible-Self, an optimism-fostering exercise, the control group wrote about their typical day. During pain stimulations, intensity and aversiveness of stimuli were evaluated, the heart rate was measured and the mimic was analyzed with the Facial Action Coding System.

Hypotheses: Differences between pre- and post-treatment ratings of painful stimuli, heart rate response and facial expression were expected to be higher in the optimism group.

Results: The two groups didn’t differ significantly in their ratings. The analysis of heart rate changes and mimic is in progress.

Implications: The results challenge numerous prior findings which report negative associations between optimism and pain.

DO 51
I WANT TO SLEEP BETTER: EFFECTS OF VOLUNTARILY CONTROL ON OBJECTIVE SLEEP PARAMETERS

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Sleep is mainly regulated by homeostatic and circadian factors, and sleep disturbances are typically treated by pharmacological interventions. However, a large portion of non-organic sleep disturbances are caused by psychological factors including worrying, perceived prospective threats and negative recurrent thoughts, suggesting that sleep is strongly influenced by cognitive and affective mechanisms. In support of this notion, we have recently shown the duration of objectively measured slow-wave sleep (SWS) can be extended by using hypnotic suggestions to sleep deeper. Here we aim at testing whether healthy participants are capable of voluntarily influencing objective sleep parameters even without hypnosis. We predict that participants can voluntarily worsen but not improve their sleep as compared to a normal sleep condition.

18 healthy young volunteers participated in one adaptation night and three experimental nights. All nights were done on the same weekday with an interval of one week. Polysomnography and subjective sleep quality was measured during all four nights. In the three experimental nights, participants either had to sleep “normal”, worse than normal, or better than normal, in a balanced order.

The results show that the subjective and objective sleep onset latency as well as the time spent awake after sleep onset could be significantly altered. In the same direction changed the parameters slow wave sleep and total sleep time, which showed a significant increase. The results demonstrate that it is possible to influence sleep voluntarily. Findings show a first answer to the question if sleep is influenceable within one’s mean.

DO 52
Activation in the mirror neuron system during social cognition varies with schizotypy traits in healthy participants

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Face processing (FP), emotion recognition (ER) and affective theory of mind (aToM) are crucial social-cognitive functions that have been linked to activation in the mirror neuron system (MNS), but experimental paradigms allowing a direct comparison of their neural correlates are still sparse. Further, there is the first evidence that reduced mirror neuron functioning might be a neural basis for social-cognitive deficits in schizophrenia, emphasizing the neural correlates of social cognition in healthy and patient samples.

74 healthy participants joined an event-related social cognition task (ER, aToM, FP, and a control task) and completed the schizotypal personality questionnaire (SPQ; consisting of positive pathology, negative pathology, and disorganization). ER and aToM both resulted in activation in regions of the human mirror neuron system, namely in inferior frontal gyrus (IFG) and superior temporal sulcus (STS). Further, activation was higher in the bilateral STS and left amygdala during aToM in comparison to ER. Region of interest analyses revealed positive correlations between positive pathology and activation in bilateral IFG, as well as between disorganization and activation in right IFG and right STS during FP. These findings indicate a shared neural basis for ER and aToM while aToM seems to put even higher demands on regions for the processing and understanding of emotions. The positive association between MNS activation and schizotypy traits suggest that MNS hyperactivity during FP might present an intermediate phenotype for the schizophrenia spectrum and may cause a proneness for the faulty reception of emotions and intentions.
DO 53
Effects of semantic and orthographic-phonological knowledge on context-based predictions during visual word recognition
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Predictive coding (PC) theory assumes that efficient neuronal processing is realized by predicting upcoming sensory events, confining processing to unpredicted inputs. PC presumably involves different frequency bands: High-gamma and theta activity indicate prediction errors, while beta activity relates to maintenance of the current cognitive set (i.e., beta power is high in top-down states when no change is predicted). Low-gamma activity presumably indicates successful match between prediction and input. In predictable contexts, increased knowledge about stimuli should enable more accurate predictions, additionally increasing processing efficiency. To test this hypothesis, we investigated the influence of semantic and orthographic-phonological knowledge on context-based predictions of visual words, using magnetoencephalography (MEG). 39 participants completed four pseudoword familiarization and one MEG session. Context-based predictions were realized by presenting pairs of two letter-strings identical in 80% of trials. Knowledge-based predictions were inherent to the letter-strings: words (semantic knowledge), familiarized pseudowords (orthographic-phonological knowledge) and novel pseudowords. Significant power reductions for repeated stimuli occurred in theta, beta, and high-gamma bands, whereas low-gamma activity significantly increased. Reduced high-gamma and theta power for more predictable stimuli is consistent with prediction error minimization. Higher low-gamma power for predictable stimuli may reflect successful matches between prediction and input. Moreover, higher beta power at the first stimulus when no change in the subsequent input is predicted might correspond to maintenance processes. Repetition suppression effects were not significantly influenced by knowledge. Thus, a facilitative influence of knowledge for time-frequency activations is not supported. Nevertheless, results support distinct roles of different frequency bands during context-based PC.

DO 54
Decomposing temporal variability of EEG data reveals differences in neural networks and their effectiveness to control response inhibition between childhood and adulthood
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Cognitive control processes like response inhibition are subject to strong developmental changes between childhood and adulthood. Considerable efforts have been made to elucidate the affected system neurophysiological mechanisms. But while it is well-known that developmental changes affect intra-individual variability, this potential bias has largely been neglected when investigating the neurophysiology underlying developmental differences between children and adults.

In the current study, we therefore investigate response inhibition processes in N=21 children (between 10 and 14 years) and n=24 adults (between 20 and 29 years) by decomposing EEG (event-related potential, ERP) data on the basis of the latency and temporal variability of involved sub-processes and combine this with source localization. The behavior data shows that children showed more impulsive behavior than adults. Importantly, a reliable match between the ERP and behavioral data could only be found when accounting for intra-individual variability in the EEG data. This decomposed data showed that children and adults use similar neurophysiological mechanisms at the response selection level to accomplish inhibitory control (C-component cluster in the decomposed data), but seem to engage different neuroanatomical structures to do so: In adults, these processes were related to the medial frontal cortex. In children, the same processes were reflected in a shift of the scalp topography and related to the superior parietal cortex. This shift in neural networks showed a lower effectiveness in exerting inhibitory control. The study underlines the necessity of accounting for intra-individual variability when examining the system neurophysiology developmental effects on cognitive functions.

DO 55
Episodic Future Thinking reduces Temporal Discounting in Healthy Adolescents
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Episodic Future Thinking reflects the capacity to simulate personal future events in detail. This capacity has previously proven efficient in
reducing impulsive choice behavior in several adult populations. Whether it also has a beneficial impact on choice behavior in adolescents is not known. We investigated the impact of episodic future thinking on discounting behavior in a sample of healthy adolescents (n = 44, age range 13–16 years). Executive function, developmental measures and alcohol use were assessed as potential moderators of the effect. Our results corroborate the findings in other populations, showing that discounting behavior in trials which included episodic future thinking was significantly less impulsive than in control trials (t = 2.74, p <.01, dz =.44). Neither executive function nor alcohol use, but developmental measures explained variability in the effect of episodic future thinking. These findings reveal that episodic future thinking can improve adolescent decision making, while the effect is to some degree modulated by developmental measures.

DO 56
Trustgame für Paare: Entwicklung eines Instruments zur ökologisch validen Messung von Vertrauen in Paarbeziehungen

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DO 57
The effect of prefrontal neuromodulation on emotion regulation and aggression in a group of criminal offenders
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The inability to regulate negative emotions is a key indicator for criminal behavior. Previous research reveals the significant contribution of the dorsolateral prefrontal cortex (dlPFC) to the regulation of negative emotions. Studies find a negative relation between the BOLD activity of the dlPFC and aggressive behavior.

In this sham-controlled double-blind study we use non-invasive transcranial direct current stimulation (tDCS) to enhance the neural excitability of the right dlPFC in order to improve cognitive control and the ability to regulate negative emotions in a group of criminal offenders in comparison to a matched control group.

Convicted criminal offenders underwent an emotion regulation task adapted from Feeseer et al. (2014) using the IAPS image set. Preliminary results indicate that the ability to regulate negative emotions benefits from active anodal stimulation. Furthermore, ongoing fMRI data analyses indicate a tendency that these behavioral outcome measures are correlated with increased BOLD activation in the dlPFC induced by the anodal tDCS stimulation. Given that the group of criminal offenders shows a general hypoactivity of prefrontal cortical regions, as well as emotion regulation deficits, we expect that the effects of active tDCS stimulation on the dlPFC will be more pronounced in this group compared to the effects in the control group.

Our results deepen the understanding of the neurobiological mechanisms underlying emotion regulation and aggression in criminal offenders, which might help to pave the way for future applications of tDCS as a therapeutic treatment.

DO 58
Hirnstrukturelle Korrelate von intrusivem Wiedererleben bei Sozialer Angststörung
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DO 59
Anodal tDCS enhances verbal episodic memory in initially low performers only
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The left dorsolateral prefrontal cortex (dlPFC) is involved in encoding and retrieval of episodic memories, and thus, is frequently targeted in brain stimulation paradigms, aiming for their modulation. Anodal transcranial direct current stimulation (tDCS), that boosts neuronal excitability in stimulated cortical areas, has been found to increase cognitive skills depending on the respective baseline level. Therefore, we hypothesized that the benefit of tDCS on verbal episodic memory can be extrapolated from the participants’ baseline level.

In the present randomized, double-blind, parallel study, healthy young adults (n = 43) received either real anodal or sham tDCS over their left dlPFC during the encoding phase of a verbal episodic memory task. Forty words were presented visually thrice in a pseudo-randomized
order with immediate vocal retrieval after each block and an additional delayed recall. A moderation analysis was conducted to test the modulating effect of the initial retrieval on the delayed recall under real or sham stimulation. Since different list segments have been linked to distinct cognitive abilities and because of the serial position effect, we focused on midlist items during first retrieval to draw a conclusion regarding the individual’s baseline level in episodic memory.

We found that the number of remembered midlist words in the first retrieval significantly moderated the stimulation effect in such a way that initially low performers experienced the highest gain from real stimulation. This suggests that the predicted stimulation effect is even greater in cognitively impaired cohorts, such as patients suffering from a neurodegenerative disease.

DO 60

The norepinephrine system affects specific neurophysiological subprocesses in the modulation of inhibitory control by working memory demands

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Inhibitory control processes are known to be modulated by working memory demands. However, the neurobiological mechanisms behind these modulations are inconclusive. One important system to consider in this regard is the locus coeruleus (LC) norepinephrine (NE) system. In the current study the role of the LC–NE system by means of pupil diameter recordings that are integrated with neurophysiological (EEG) and source localization data were examined. A combined model-rotation Go/Nogo task was used. The results show that increases in working memory load complicate response inhibition processes. On a neurophysiological level these effects were reflected by specific modulations in event-related potentials (ERPs) reflecting motor inhibition processes (i.e., Nogo-P3). Attentional selection processes (reflected by the P1 and N1) as well as pre–motor inhibition or conflict monitoring processes (reflected by the Nogo-N2) were not affected. Activity of the LC–NE systems, as indexed by the pupil diameter data, predicted neurophysiological processes selectively in the Nogo-P3 time range. Source localization analyses suggest that this modulation occurs in the right middle and inferior frontal gyrus. The study provides evidence that the LC–NE system is an important neurobiological system modulating the effects of working memory load on response inhibition processes. More specifically, it modulates a subset of dissociable cognitive processes that are related to prefrontal cortical regions.

DO 61

Sex differences during non-social provocation

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Social provocation mostly triggers aggressive responses involving retaliatory behavior towards the provoking individual. However, emotional reactions in subsequent frustrating situations outside of a social context likewise might be enhanced. In total 28 participants (14 males, 14 females) took part in the experiment on emotional, behavioral and physiologic (skin conductance) reactions towards experimentally induced frustration in a non-social context (Technical Provocation Paradigm, TPP). In the TPP participants were asked to direct a virtual ball in a bottle to earn money via moving a joystick. Unknown to the participant, in provocation trials the joystick function was disabled. Prior to the TPP, half of the participants performed the Point Subtraction Aggression Task (PSAP), including social provocation.

Overall, the TPP significantly increase negative mood and anger during provocation blocks. This was supported by increased skin conductance responses. Moreover, higher amplitudes describing the joystick movement were measured in the provocation block. Interestingly, men moved the joystick more strongly if they played the PSAP before the TPP. In males compared to females significantly increased skin conductance responses were observed during the TPP, which were mainly driven by the first provocation block. During the social provocation task, aggressive or defensive responses were not significantly different between sexes.

The current findings highlight the effectivity of non-social provocation on emotional and behavioral reactions. Moreover, previous social provocation can enhance the frustration effect in men. Interestingly, this effect of social provocation was only observed in a subsequent non-social context. It thus might indicate a projection of frustration in men.
DO 62
Effects of pre-extinction stress on extinction recall in men and women with high and low 17β-estradiol (E2) levels
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Fear extinction is a model for the etiology and treatment of anxiety, trauma- and stressor- related disorders. In a recent study with healthy men, we found that acute stress (cold pressor test: CPT) enhanced extinction recall compared to control. As women are at a higher risk to develop the above disorders, and because low E2 was linked to extinction deficits, we repeated the study with women differing in E2 levels. We tested 40 free-cycling women during midcycle (MC: high E2, low progesterone [P4]), and 40 women on oral contraceptives (OC: low E2, low P4). Pooling both samples, we compare CPT-effects in men (n=40), MC-, and OC-women. Differential fear conditioning comprised habituation, acquisition, extinction training (Day 1), and extinction recall (Day 2), with CPT or a warm-water-control directly before extinction training. The unconditioned stimulus was a 2-s, 95 dB(A), aversive sound; 2 geometric figures were counterbalanced as conditioned stimuli (CS+/CS-). Our learning measure were skin conductance responses (SCRs). In women, E2 and P4 were measured in saliva. CPT-stress was successfully validated in peripheral physiology, cortisol, and pain ratings. CPT improved extinction recall in the overall sample, mainly due to men’s responses. Stressed MC-women showed a trend for better extinction recall, but there was no stress effect in OC-women. Irrespective of OC/MC group, higher E2- (not P4-) levels were associated with extinction retention (ER), especially after stress. In stressed participants of both sexes, better retention was associated with stress-induced increases in blood pressure and cortisol. Further extinction-related analyses are reported.

DO 63
Neural Mechanisms Associated With Retrieval of Self-Chosen and Assigned Tasks and Their Relationships to Emotion Regulation Abilities
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Chronic pursuit of self-incongruent goals induces feelings of dissonance and reduces well-being. In an fMRI study we tested 32 participants to investigate neural correlates of task choice, memory retrieval, and emotion regulation. Participants completed an emotion regulation questionnaire. During fMRI, they first chose tasks by themselves and were then assigned tasks, both from equally attractive tasks arranged in triples. Some of the tasks seen were neither self-chosen nor assigned (remaining). After filler tasks, participants retrieved from memory for each item whether it was self-chosen or assigned. We used GLM Flex Fast to calculate a 3 (source: self, assigned, remaining) x 2 (memory retrieval: self, assigned) ANOVA with participant as random factor. During retrieval, emotion regulation abilities were positively correlated with corpus callosum activity. Furthermore, retrieving originally self-chosen tasks was associated with increased activation of the right frontal gyrus. Retrieving tasks that were originally remaining was associated with right cingulum activation. Importantly, an interaction effect of source and memory retrieval precipitated in the anterior cingulate cortex (ACC). Specifically, retrieving originally self-chosen tasks as assigned (versus retrieving them as self-chosen) was associated with increased ACC activation. Furthermore, retrieving originally assigned and remaining tasks as self-chosen (versus retrieving them as assigned) was associated with increased ACC activation. The results, in particular, ACC activation as a conflict detector for misremembered and specifically self-incongruent tasks, will be discussed. The findings combine lines of research on neural correlates of decision-making, memory, self-congruence and emotion regulation.

DO 64
Pulse transit time is associated with cardiac modulation of startle
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Cardiovascular parameters may have an impact on individual cardioafferent neural traffic which in turn plays a crucial role in emotion and symptom genesis of body-related mental disorders. We investigated, whether parameters as heart rate and blood pressure may be determinants of cardiac modulation of startle (CMS), a ‘background’ methodology for assessing baro-afferent signal transmission. Therefore, 30 healthy volunteers received acoustic startle stimuli (105 dB) at 9 different latencies relative to the R-wave (R+ 0, 100, 200, 300, 400, 500, 600, 700, and 800 ms; randomized order) after a resting period in which cardiovascular data (Heart rate [HR], heart rate variability [HRV], Pulse transit time [PTT], blood pressure [BP] and blood pressure variability [BPV]) were assessed. We found a strong positive association between CMS and PTT. Stroke volume, which is directly linked to PTT, may have an impact on this relationship, as it does on interoception. We conclude that PTT is associated with cardiac modulation of startle and that stroke volume may play an important role in this relationship.
Einfluss von akutem Stress auf die Verhaltensinhibition – eine ERP Studie

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Stress beeinflusst verschiedene Kognitionen, wie zum Beispiel Lernen und Gedächtnisbildung/-abruft. Der Einfluss von Stress auf exekutive Funktionen ist erst in den letzten Jahren vermehrt untersucht worden. Diese Studien zeigen, dass akuter Stress das Arbeitsgedächtnis, kognitive Flexibilität und kognitive Inhibition negative beeinflusst, während Verhaltensinhibition durch Stress verbessert zu werden scheint.


Diese Ergebnisse bestätigen bisherige Befunde zur verbesserten Verhaltensinhibition durch akuten Stress. Gleichzeitig deuten sie darauf hin, dass die zugrundeliegenden kognitiven Prozesse unterschiedlich beeinflusst werden und dass Cortisol bei der Umverteilung kognitiver Ressourcen durch Stress entscheidend ist.
DO 67
Neuronale Basis kognitiver Emotionsregulation bei sozialer Angststörung

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DO 68
Mindset and Priming influence food choices.

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In our obesogenic environment, food-related cues constantly remind us of tasty, unhealthy foods. Previous studies using the Pavlovian-to-instrumental transfer (PIT) task have shown that food-related cues can bias responding towards those same foods. We investigated whether choices for an unhealthy (crisps) over a healthy snack (zucchini) could be reduced (a) following a health vs. palatability mindset induction and/or (b) by logos that were previously associated with healthy/unhealthy or palatable/not palatable.

96 subjects first earned crisps and zucchini by specific button presses. Subsequently, participants learned Pavlovian associations between abstract cues and these foods. During the test phase (T1), participants responded for these foods while occasionally the Pavlovian cues were presented. For the mindset induction, subjects rated food pictures on a VAS for healthiness or palatability whether choices for an unhealthy (crisps) over a healthy snack (zucchini) could be reduced (a) following a health vs. palatability mindset induction and/or (b) by logos that were previously associated with healthy/unhealthy or palatable/not palatable.

In conclusion, we showed that the external environment can favor either healthy or unhealthy choices dependent on the presence of food-associated cues. Furthermore, we showed that choices can be influences by inducing either a health or palatability mindset.
DO 69
Der Effekt von akutem Stress auf neuronale Korrelate appetitiver Konditionierung und hippocampaler Konnektivität
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DO 70
Childhood Maltreatment is Associated with Increased Risk of Subclinical Hypothyroidism in Pregnancy.
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The critical importance of thyroid hormones for fetal development is well established. The developing fetus is dependent on the mother for adequate thyroid hormone supply, and maternal thyroid dysfunction in pregnancy may result in suboptimal fetal development. Because exposure to childhood maltreatment (CM) has been associated with thyroid dysfunction in the non-pregnant state, we sought to test the hypothesis that exposure to CM may represent a risk factor for the development of maternal hypothyroidism in pregnancy. The study was conducted in a healthy cohort of 89 pregnant mothers who were followed across the entire course of pregnancy. At each trimester thyroid-stimulating hormone (TSH) and free thyroxine (fT4) were measured in maternal serum. Experience of CM was assessed using the Childhood Trauma Questionnaire. After adjusting for potentially confounding variables, CM exposure was associated with increased TSH concentrations across pregnancy (F(1,80) = 9.73, p = .003) and with a 5- to 6-fold increased risk of TSH levels above the trimester-specific clinical cut-off values. Women with clinically elevated TSH concentrations did not differ in fT4 concentrations from women with normal TSH concentrations (p > .1), suggesting subclinical hypothyroidism. Our findings suggest that there is a substantial and clinically relevant increased risk for thyroid dysfunction during pregnancy among women exposed to abuse or neglect in their childhood. This could potentially have adverse consequences for fetal brain development. Thus, these findings highlight the critical importance of considering CM exposure as a potential risk factor for (subclinical) hypothyroidism in pregnancy.

DO 71
GENERAIN – eine generationsübergreifende Eye-Tracking Studie zu Aufmerksamkeitsprozessen bei Depression
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Kinder, deren Eltern an Depression erkrankt sind, haben ein stark erhöhtes Risiko selbst eine Depression zu entwickeln. Implizite kognitive Bias für negative Informationen, die sowohl bei Erwachsenen als auch bei Kindern und Jugendlichen die an Depression leiden, gefunden wurden, könnten einer der Mechanismen sein, durch die das Erkrankungsrisiko von Eltern an ihre Kinder weitergegeben wird. Das Vorhandensein dieser Bias bei Kindern depressiver Eltern wurde bislang jedoch nur selten untersucht. Eye-Tracking Paradigmen eignen sich für die Erfassung impliziter Aufmerksamkeits-Bias (AB) besonders gut, da sie ermöglichen, die Allokation visueller Aufmerksamkeit im Verlauf aufzuzeichnen, wodurch sich Bias ökologisch valid erfassten lassen als mit Hilfe rein reaktionszeitbasierter Methoden. Eine der ersten Studien, die sich diese Möglichkeit zunutze gemacht hat, untersuchte mittels einer passiven Betrachtungsaufgabe (beider jeweils ein neutrales, freundiges, trauriges und wütendes Gesicht simultan dargeboten wurden) den AB bei an Depression erkrankten Kindern (Harrison & Gibb, 2015). Es fanden sich Hinweise darauf, dass depressive Kinder im Vergleich zu einer gesunden Kontrollgruppe traurige Gesichter vermeiden. Die vorliegende Studie verwendet dasselbe Eye-Tracking Paradigma um diesen AB bei Kindern depressiver Eltern zu untersuchen. Zusätzlich exploriert ein transgenerationaler Aspekt, ob der AB der Kinder durch den der Eltern vorhergesagt werden kann. Es werden Eltern-Kind-Paare aus...
Familien, in denen mindestens ein Elternteil von Depression betroffen ist (n = 40) und Familien, in denen kein Elternteil jemals an einer psychischen Erkrankung gelitten hat (n = 40), verglichen. Die Datenerhebung ist abgeschlossen und die Daten werden gegenwärtig analysiert, sodass neueste Ergebnisse auf der Tagung Psychologie und Gehirn präsentiert werden können.

DO 72
Neurophysiologische Korrelate der Verarbeitung emotionaler Gesichtsausdrücke bei Jugendlichen mit Anorexia nervosa
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Anorexia nervosa (AN) geht häufig mit emotionalen und sozialen Schwierigkeiten einher. Doch obwohl emotionale Gesichter eine der wichtigsten sozio-emotionalen Stimuluskategorien darstellen, wurden die neuronalen Grundlagen der Gesichterverarbeitung bei AN bisher wenig untersucht. Die vorliegende Studie untersucht die neurophysiologischen Korrelate (ereigniskorrelierte Potenziale; EKPs) der Gesichterverarbeitung bei Jugendlichen mit AN (n = 20) im Vergleich zu einer gesunden (n = 24) und einer depressiven (n = 16) Kontrollgruppe. Mädchen im Alter von 12–18 Jahren wurden untersucht. EKPs wurden während einer passiven Aufgabe und drei aktiven Aufgaben, die die Verarbeitung emotionaler Gesichter in unterschiedlicher Verarbeitungsstufe erforderlich, aufgezeichnet. Eine der aktiven Aufgaben erfasste zudem die Emotionserkennungsfähigkeiten auf Verhaltensebene. Obwohl keine behavorialen Gruppenunterschiede zu finden waren, zeigte sich auf der neurophysiologischen Ebene, dass alle Gesichtsausdrücke bei Patientinnen mit AN eine geringer ausgeprägte Early Posterior Negativity (EPN) auslösten als bei den Kontrollgruppen. Die EPN ist eine frühe EKP Komponente, die eine automatische Wahrnehmungs- und Verarbeitungsstufe reflektiert und die durch die intrinsische Salienz emotionaler Stimuli moduliert wird. Es fanden sich weder Unterschiede in früheren Komponenten, welche initiale Aufmerksamkeitslenkung (P100) und strukturelle Verarbeitung von Gesichtern (N170) reflektieren, noch in einer späteren Komponente, die elaborierte, kognitive Emotionserkennungsfähigkeiten repräsentiert (LPP). Die weniger ausgeprägte EPN bei Jugendlichen mit AN deutet darauf hin, dass die Gesichter anderer Menschen für sie weniger intrinsisch salient sind, d.h. möglicherweise als weniger relevant oder „wichtig“ wahrgenommen werden. Da AN Patientinnen sich von beiden Kontrollgruppen unterschieden kann davon ausgegangen werden, dass es sich um eine AN-spezifische Veränderung handelt die nicht durch komorbide depressive Symptomatik erklärt werden kann.

DO 73
A Variation in the Oxytocin Receptor Gene Moderates the Relationship Between Early Maternal Care In Childhood And Interleukin 6 (IL-6) Concentrations During Pregnancy
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Background
The quality of the early environment may have long-term effects on mental and physical health and may be transmitted between generations. This transmission likely occurs already during pregnancy, perhaps mediated by stress-sensitive biological mechanisms. One potential underlying mechanism could be early-life stress (ELS)-associated maternal inflammation during pregnancy that may alter fetal development. Genetic variations (SNPs) in the oxytocin receptor gene (OXTR) were shown to affect individual susceptibility to ELS. Based on the anti-inflammatory properties of oxytocin, the aim of this study was to test whether variations in the OXTR gene moderate the maternal ELS-inflammation association during pregnancy.

Method
Early in pregnancy, women (N=93) were recruited and data on early maternal care (Parental Bonding Inventory), sociodemographic indicators (age, income, education, and race/ethnicity), and body mass index (BMI) were collected. Maternal blood was obtained at each trimester to quantify interleukin-6 (IL-6) by immunoassay. DNA was extracted and maternal genotype for OXTR SNP rs139832701 (G/T) was determined.

Results
After controlling for race/ethnicity, BMI, and SES, a negative association between early maternal care and mean pregnancy IL-6 concentrations was observed in G allele carriers (r=-.543, p=.009, n=27), but not in T allele homozygotes (r=.005, p=.975, n=56). The correlations differed significantly from each other as tested by Fisher’s z test (z=-2.693, p=.006).

Discussion
Results suggest a genotype-specific association between maternal care during the mothers’ childhood and systemic inflammation during pregnancy. Maternal inflammation during pregnancy may influence fetal development and may, therefore, be a pathway of transmission of ELS.
DO 74
The time course of cognitive control: New insights under relaxed linearity assumptions.
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Objective: The relationship between predictor variables and brain activity is often assumed to be linear. However, there exist many situations for which this assumption does not hold. To demonstrate this, we focussed on recent findings (Braver, Gray & Burgess, 2007) suggesting that cognitive control operates in two distinct modes. The first, proactive control, is resource costly and preparatory. The second, reactive control, is flexible and allows corrective behavioural adaption. We believe that these processes achieve balance in accordance to task demands and are optimised over time. Further, we believe that these processes are best represented by the magnitude of fronto-central (e.g. CNV) and fronto-parietal (e.g. P3) brain potentials (i.e. ERPs).
Method: EEG from 60 participants was recorded during a Continuous Performance Task. Here, participants needed to establish stable proactive control based on the predictive value of cues. Conversely, reactive control was necessary when these predictions were violated. Further, we combine spline regression and multilevel modelling (MLM) to illustrate the relationship between ERPs and the predictors (e.g. predictability, expectancy violation, and time on task). Results: Activation patterns for the preparatory and reactive control modes differed significantly, as well as their (curvilinear) modulations through time. Discussion: Results indicate that non-linear MLM offers new insights into the modelling of EEG-data. We discuss its advantages in terms of incremental validity, goodness of fit and statistical power.

DO 75
Comparing multimodal data integration approaches for simultaneous EEG/fMRI recordings.
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Objective: Multimodal data integration is a promising approach for the analysis of simultaneously recorded EEG and fMRI data. It allows experimenters to move away from reporting results from isolated methods, examine common features and adapt multiple perspectives on brain activity, and thus to considerably improve the validity of the conclusions drawn from experimental imaging data. Method: To test different analysis frameworks for multimodal data integration we implemented simultaneous EEG-fMRI data acquisition from nine subjects during a Continuous Performance Task. Results from both single and combined analyses are reported. Results: Joint signal components explaining overlapping variation in EEG and fMRI could be found with multiple methods. Of particular interest, frontal and parietal activation patterns could be isolated during exertion of preparatory control and reactive behavioural adaption. Discussion: Our results show that multimodal data integration can be used to extract and isolate information that would otherwise have been lost using conventional contrasts or grand averages. Further, the multimodal analysis framework may have an incremental validity as it better characterizes the temporal and spatial dynamics of brain functioning.

DO 76
Kognitive Fehler im Alltag, Selbstgerichtetheit und das Salienznetzwerk
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Imagine the anger! Mental representations of faces can be assessed by eye-movements

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Mental representation of facial emotions is thought to be based on the simulation of emotional expressions. However, little is known about the mechanisms of such imagery processes. The current study compared gaze behavior during imagery and during viewing of emotional facial expressions. Fifty healthy participants were instructed to imagine neutral faces becoming angry, fearful, or happy. To this end, neutral faces served as cues, which were replaced by a blank mask, in which participants had to imagine the instructed emotional expressions. In addition, imagination of different clock times served as a control condition. During the second half of the experiment, participants freely viewed the previously imagined facial expressions and clock times. Scanpath lengths and fixation durations were compared during mental imagery and free viewing. Overall, participants displayed longer fixation durations and shorter scanpaths during mental imagery compared to free viewing. This reduction of eye movements was observed for both imagined faces and clocks. Regarding facial emotions, imagining angry faces led to longer fixation durations and shorter scanpath lengths relative to fearful and happy faces. This was especially pronounced for participants with higher fear of negative evaluation (FNE). No such difference was observed between imagined or viewing clocks. Taken together, the mental imagination of facial expressions, compared to actual viewing, is associated with reduced eye-movements. This focusing effect was particularly pronounced when imagining angry faces, and more so in participants high in FNE.

These findings open a new route for directly testing anxiety related top-down processes in face perception.

The more the better? - Individual differences in adaptive emotion regulation skills repertoire is associated with activation in emotion and emotion regulation brain networks

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Previous results point to the importance of examining the use of additional (non-instructed) emotion regulation (ER) strategies in the context of ER laboratory paradigms. Therefore, we analysed how individual differences in ER skill repertoire contribute to brain activation during emotion regulation. We reinvestigated data of 125 healthy subjects (63 f, 20 - 35 years) participating in an ER fMRI task and completing questionnaires on adaptive ER skills, personality, depression, and anxiety. To determine groups with similar ER skill patterns, a hierarchical cluster analysis was performed using the ER Skill Questionnaire (ERSQ). We identified 3 classes of individuals: (1) medium skills in several adaptive ER strategies, (2) consistently low skills in multiple adaptive ER strategies, and (3) consistently high skills in multiple adaptive ER strategies (N1=69, N2=33, N3=23). Additionally, we created a score of “ER skill repertoire” reflecting the number of strategies the subjects reported to have high skills in. As proof of concept, subjects of cluster 2 significantly reported the lowest repertoire and the highest scores in neuroticism, depression, and anxiety (all p<0.01). Furthermore, cluster 2 differed significantly in terms of brain activation in key brain areas of emotion reactivity and regulation (Occipital Cortex, Inferior Frontal Gyrus, and Frontal Pole, Inferior Parietal Cortex, Dorsolateral Prefrontal Cortex; p<0.05; FWE). Results indicate that individual differences in adaptive ER skill repertoire play a significant role in psychological well-being, and show associations with the activation of emotion regulation brain networks. Our work has several methodological and theoretical implications, which have to be discussed.

Regional spezifische Veränderungen der Hauttemperatur im Gesicht unter Stress

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aufgezeichnet und mittels eigens entwickelter MATLAB-Skripte analysiert. Hierbei wurden die Eigenvektoren aus Schwellwert-separierten Datensätzen verwendet, um die Gesichtsformen auszurichten (Drehen, Verschieben und Skalieren). Vor der Auswertung der interessierenden Regionen wurden die Daten an ein standardisiertes Gesicht angepasst. Es wurde ein signifikanter Rückgang der Gesichtstemperatur insbesondere in der Wangenregion beobachtet, wohingegen andere Regionen ein gegenläufiges Muster zeigten. Die Ergebnisse deuten darauf hin, dass die Thermografie ein vielversprechender Ansatz für die Analyse von stressinduzierten physiologischen Prozessen ist.

DO 80
Amygdala Reaktivität und Kooonnektivität als Risikofaktor für Posttraumatische Belastungsstörung
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DO 81
Evoked theta oscillations enhance episodic memory performance
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The formation of episodic memories is associated with increases in theta and gamma power co-occurring with reduced alpha power in the human electro- and magnetoencephalogram (EEG and MEG). Furthermore, recent studies suggest a critical role of theta-gamma phase-to-amplitude coupling (PAC) for successful episodic encoding. However, due to the correlative nature of neurophysiological measures, questions remain regarding the functional role of these frequency bands. In the present study we experimentally manipulated oscillatory processes during encoding by presenting pictorial stimuli at individually determined theta or alpha frequencies to elicit visually evoked potentials in these specific frequencies (steady state visually evoked potentials; SSVEPs). First, this was to test whether evoked theta oscillations would facilitate memory formation, in contrast to evoked oscillations in the alpha band. Second, our analysis focuses on subsequent memory effects of gamma oscillations induced by individual theta SSVEPs, compared to induced alpha SSVEPs, to scrutinize the functional role of the interplay between theta and gamma oscillations. Behavioral results confirm the proposal that theta SSVEPs led to higher memory performance compared to alpha SSVEPs. Preliminary analyses also confirm that theta induced gamma oscillations are more predictive for subsequent memory performance compared to alpha induced gamma oscillations. These findings provide strong evidence for a functional difference of theta and alpha oscillations and highlight the specific function of theta-gamma coupling processes in episodic memory formation.

DO 82
Investigating Spatial and Temporal Contingency Awareness in Unilateral Trace Eyelblink Conditioning
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Trace eyelblink conditioning (TEBC) depends on hippocampal activation as well as conscious contingency awareness (CA) and has therefore been proposed as a simple model of declarative memory. In classical delay eyelblink conditioning, which occurs independently from CA, laterality effects, i.e. stronger conditioned responses (CR) ipsilateral to a unilaterally applied unconditioned stimulus (US), have frequently been reported. This was also shown in one prior TEBC study with contingency-aware participants. To further investigate the relation between CA and spatial conditioning different EBC conditions were employed. Participants (N=34) were presented with three different frequencies (CS: 1000Hz, 1400Hz, 1800Hz; 1sec) that were coupled to either a left, right or no airpuff (US: 15psi 50ms) occurring immediately or one second after tone offset (1000ms trace-interval). The coupling of
Die Befunde sind ermutigend, aber es ist zu beachten, dass die geringe Anzahl an untersuchten Probanden die Aussagekraft stark ein. Allerdings schränkt die geringe Anzahl an untersuchten Probanden die positive Effekte feststellen. Bis her erhöhte. Auch bezüglich der Funktionsfähigkeit im Alltag ließen sich die Ergebnisse nur de-

**DO 83**

Ein auf langsamen kortikalen Potenzialen beruhendes Neurofeedback-Training zur Erhöhung der Aufmerksamkeitsleistung und der Selbstwirksamkeitserwartung bei Patienten nach Schlaganfall

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Neben körperlichen Beeinträchtigungen stellen cognitive Defizite häufige Folgen eines Schlaganfalls dar. Darunter fallen Aufmerksamkeitsdefizite, die die erfolgreiche Teilnahme an Rehabilitationsmaßnahmen erschweren und die Orientierung und Funktionsfähigkeit im Alltag beeinträchtigen. Es gibt in der Forschung bezüglich des Aufmerksamkeitsdefizit-Syndroms Hinweise darauf, dass ein Neurofeedbacktraining, das auf langsamen kortikalen Potenzialen (LKP) beruht, unterstützend wirkt und die Aufmerksamkeitsleistung erhöht. Daher soll in der vorliegenden Studie das LKP Training auf Schlaganfallpatienten übertragen und die Wirksamkeit auf die Aufmerksamkeitsleistung geprüft werden. Außerdem könnte die Erfahrung, Kontrolle über LKPs zu erlangen, die Selbstwirksamkeitserwartung erhöhen und so eine positive Auswirkung auf die subjektiv empfundene Lebensqualität haben. In der vorliegenden Studie wurden bisher drei Patienten mit Aufmerksamkeitsdefiziten untersucht. Alle wurden bezüglich ihrer Aufmerksamkeitsleistung, sowie ihrer Selbstwirksamkeitserwartung bevor und nachdem sie ein Neurofeedbacktraining (20 Sitzungen) absolvierten, getestet. Da die Stichprobengröße sehr gering ist, lassen sich die Ergebnisse nur deskriptiv darstellen. Es zeigte sich, dass die Patienten Kontrolle über ihre LKPs erlangen konnten und sich die subjektive Selbstwirksamkeitserwartung erhöhte. Auch bezüglich der Funktionsfähigkeit im Alltag ließen sich positive Effekte feststellen. Bisherige Befunde sind ermutigend, allerdings schränkt die geringe Anzahl an untersuchten Probanden die Aussagekraft stark ein.

**DO 84**

Self-regulation of prefrontal structures in PTSD: a rt-fMRI neurofeedback investigation

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Deficits in self-regulation of cognitions and emotions are characteristic for post-traumatic stress disorder (PTSD). Cognitive reappraisal is regarded as an effective strategy for emotion regulation. It has been associated with an increase in activation in the lateral prefrontal cortex (LPFC). Prefrontal structures exert control over other brain regions that are involved in the processing of emotions. In PTSD, studies have shown reduced LPFC activation during reappraisal (e.g. Xiong et al., 2013). Here, we implemented real-time fMRI (rt-fMRI) based neurofeedback to enhance self-regulation of the left LPFC via cognitive reappraisal in patients with PTSD and healthy volunteers.

**DO 85**

The role of spatial proximity to (optimal) effector organs in cross- and intra-modal cueing of acoustic and tactile targets

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Stimuli from different sensory modalities, e.g. sound and touch, are most effortlessly combined into joint percepts, when the stimuli share spatial origins. The current study examines this "spatial rule", but with regard to the proximity of stimuli’s spatial origins to the respective (optimal) effector organs. For instance, hands are the optimal effector organs for processing tactile information. Therefore we expect tactile stimulation of the hands to be processed more efficiently, i.e. faster and less error-prone, than tactile stimulation of the ears. Ears process acoustic information. Therefore we expect acoustic information, presented near ears to be more efficiently processed than acoustic information presented near hands. To test these hypotheses, we presented acoustic and tactile stimuli, either near participants’ hands (experiment 1) or ears (experiment 2). The stimuli were presented as pairs of (either cross- or intra-modal) cues and targets. An "alerting" cue (either acoustic or tactile) preceded a subsequent target (either acoustic or tactile). The targets required fast reactions of the participants, using foot pedals. As assumed, tactile hand stimulations enabled faster reactions than tactile stimulation near ears. However, there was no benefit for acoustic targets, presented near ears, compared to acoustic targets presented near hands. Acoustic cues were more efficient than tactile cues, in both, cross- and intra-modal
cues and Cues-Target combinations. Implications of these results on general principles of multisensory processing are discussed.

DO 86
Effects of high-dose ethanol intoxication and hangover on cognitive flexibility
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The effects of high-dose ethanol intoxication on cognitive flexibility processes are not well understood and processes related to hangover after intoxication have remained even more elusive. Similarly, it is unknown in how far the complexity of cognitive flexibility processes is affected by intoxication and hangover effects. We performed a neurophysiological study applying high density electroencephalography (EEG) recording to analyze event-related potentials (ERPs) and perform source localization in a task switching paradigm which varied the complexity of task switching by means of memory demands. The results show that high-dose ethanol intoxication only affects task switching (i.e. cognitive flexibility processes) when memory processes are required to control task switching mechanisms, suggesting that even high doses of ethanol compromise cognitive processes when they are highly demanding. The EEG and source localization data show that these effects unfold by modulating response selection processes in the anterior cingulate cortex. Perceptual and attentional selection processes as well as working memory processes were only unspecifically modulated. In all subprocesses examined, there were no differences between the sober and hangover states, thus suggesting a fast recovery of cognitive flexibility after high dose ethanol intoxication. We assume that the gamma-aminobutyric acid (GABAergic) system accounts for the observed effects, while they can hardly be explained by the dopaminergic system.

DO 87
Differential “diagnosis” for burnout and depression – does hair show the difference?
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Background: There is much debate about burnout is a form of depression or a distinct entity. Although there are many studies investigating the relationship between burnout, depression and HPA-axis, the literature remains inconclusive. To overcome interpretational shortages due to the provided assessment tools for burnout, we developed a standardized burnout section for clinical interviews. The study is the first to compare HPA-axis alterations in burnout and depression on basis of these interviews.

Method: Burnout is measured with the Composite International Diagnostic Interview (CIDI) with a new burnout-specific section. Until now we collected data and hair samples of N = 53 participants. Results are expected to confirm our pre-analysis and to support the implementation of hair cortisol 1:1048576 (HCC) as a differential diagnostic tool. In our pre-analysis data were collected from a sample of the Dresden Burnout Study (N = 417, mean ± SD age: 41.32 ± 11.22 years, 34.5% male). Symptoms of burnout and depressivity were measured with the Maslach Burnout Inventory-General Survey (MBI-GS) and Patient Health Questionnaire (PHQ-9), while HCC was determined by LC-MS/MS.

Results: Symptoms of burnout and depressivity were positively associated (rB_Dep = 0.51, p < 0.01). Furthermore burnout was correlated with HCC (rB_HCC = 0.12, p = 0.04), while no association emerged between depressive symptoms and HCC (rDep_HCC = -0.01, p = 0.97).

Conclusion: The present study indicated differences between burnout and depressivity with regard to HCC. Results of the main study, including the newly developed section for burnout, will be presented at the conference.

DO 88
The stress hormone cortisol influences approach-avoidance behavior
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Stress impacts motivational behavior, but the biological mechanisms behind this effect remain unclear. We here investigated whether the intravenous (IV) administration of a moderate dose (6 mg) of the stress hormone cortisol vs. a saline placebo solution (NaCl 0.9%) influences approach and avoidance (AA) behavior. Before IV infusion (T1: 45 minutes pre-infusion), shortly after IV infusion (T2: 2-15 minutes post-infusion), and late after infusion (T3: 62-75 minutes post infusion) male participants (n=22) reacted to 3D approximating avatars that displayed a dynamic change from neutral to either happy or fearful facial expressions by moving themselves (MOVE-SELF; phylogenetically older perspective) or moving the avatar (MOVE-OTHER; phylogenetically newer perspective) via joystick control into a central (=approach) or peripheral (=avoidance) screen position. Classical AA congruency effects were present during T1. IV cortisol administration enhanced AA effects, however, selectively in the MOVE-SELF condition during T3. These results suggest that phylogenetically older AA behavioral patterns are favored by the stress hormone cortisol, presumably mediated by genomic mechanisms.
Hohe psychosoziale Anforderungen am Arbeitsplatz Schule führen nicht nur dazu, dass Lehrkräfte in besonderem Maße von arbeitsbedingt Stress und Burnout betroffen sind, es besteht auch ein Zusammenhang zwischen der emotionalen Beanspruchung der Lehrkräfte und der Unterrichtsqualität. Deshalb sollte es ein wesentliches Bestandteil der Lehramtsausbildung sein, die Selbstregulation frühzeitig zu schulen, um einen besseren Umgang mit arbeitsbezogenem Stress zu ermöglichen. Die vorliegende Studie analysierte die Effekte eines Achtsamkeitstrainings auf Erschöpfung, Affekt und Emotionsregulation. Effekte des Trainings auf Herzratenvariabilität und Cortisoltagesprofile von Lehrkräften werden in einem laufenden Projekt untersucht. Ein klassisches Mindfulness-Based Stress Reduction-Curriculum wurde an den Kontext eines Masterseminars in der Lehramtsausbildung angepasst. 96 Studierende erhielten 8 Gruppensitzungen und wurden instruiert, täglich zu meditieren (Sitzmeditation u. Bodyscan). Eine aktive Kontrollgruppe (AKG: N=42) erhielt ein phenomenologisch orientiertes Bewusstseinstraining. Die passive Kontrollgruppe (PKG: N=31) erhielt keinerlei Training. Die Analyse erfolgte mit Hilfe von linear mixed-effect models (R). Die Achtsamkeitsintervention hatte keinen signifikanten Effekt auf das Erschöpfungserleben. Signifikante Interaktionen (Gruppe x Messzeitpunkt) zeigten sich aber in Bezug auf depressive Symptome und symptomfokussierte Ruminierung. Die Achtsamkeitsgruppe zeigte einen Abfall der Depressionsscores nach dem Training sowie gleichbleibende Ruminationswerte, während in der PKG in beiden Fällen ein Anstieg beobachtet wurde (p=0.01; p<0.05). Darüber hinaus nutzte die Achtsamkeitsgruppe mehr cognitive Reattribuierung zur Emotionsregulation als beide Kontrollgruppen (p<0.01 PKG u. p=0.06 AKG) und mehr Distraction als die PKG (p<0.01). Zusammenfassend zeigte sich, dass die Achtsamkeitsgruppe am Ende des Semesters weniger negative Affekte und bessere Emotionsregulationsstrategien aufwies. Diese könnten bei steigenden Anforderungen im Referendariat vor emotionaler Beanspruchung und Burnout schützen.

**FR 02**

Causal role of the inferolateral prefrontal cortex in the goal-directed control of behavior

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In order to successfully adapt to changing environmental demands, our behavior can be controlled by at least two distinct systems: an efficient but rigid habitual system that relies on simple stimulus-response (S-R) associations and a more flexible but slow goal-directed system that encodes more complex stimulus-outcome-response (S-O-R) associations. While several brain regions have been implicated in either of these systems, recent evidence points to the inferolateral prefrontal cortex (iPFC) as a crucial structure in balancing habitual and goal-directed behavioral control. However, this evidence is primarily based on imaging data that are correlational and therefore do not allow conclusions regarding the causal contribution of the iPFC to this balance. Here, we applied neuro-navigated, sham-controlled Theta Burst Stimulation (TBS) to either enhance or inhibit right iPFC functionality before participants completed an instrumental learning task specifically designed to test the degree of habitual and goal-directed behavioral control. TBS did not affect learning performance. However, participants that received inhibitory TBS were less able to adjust their behavior when task demands changed, demonstrating more habitual responding than participants receiving enhancing or sham stimulation. We did not find an effect for excitatory TBS. Our findings indicate a shift from goal-directed to habitual behavior after functional inhibition of the iPFC and thus indicate a causal role of the iPFC in the balance between these two systems of behavioral control.

**FR 03**

Modular structure of intrinsic brain networks explains differences in human intelligence

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General intelligence is a fundamental determinant of academic and life success. While previous human brain imaging research has identified correlates of intelligence localized in separate regions of the brain, more recent work examines how interactions between these regions in functional networks contribute to human intelligence. The brain’s functional network topology is characterized by substantial modularity. Nevertheless, how interactions within and between
network modules contribute to human intelligence is only poorly understood. We modeled subject-specific brain network graphs from functional MRI resting-state data (N=309) and examined whole brain (global) and region-specific (local) modularity. There was no association between intelligence and whole brain modularity. However, node-type classification analyses revealed significantly fewer ultra-peripheral nodes in brain networks of more intelligent people, suggesting less segregated information processing. Region-specific analyses identified four regions in which within-module connectivity (within-module degree centrality Z-score) and between-module connectivity (participation coefficient) showed opposite associations with intelligence: In the right anterior insula (AI), higher intelligence was associated with more between- and less within-module connections, while the reverse was true for the bilateral temporo-parietal junction (TPJ) and right superior frontal gyrus (SFG). AI has previously been associated with the detection, evaluation, and selection of relevant information for cognitive processing, while TPJ is involved in shielding cognitive processes against interference from irrelevant information. The specific brain modularity profile observed for more intelligent people suggests that higher network integration of AI in combination with stronger segregation of TPJ facilitates both processes simultaneously, which enables successful cognitive performance and ultimately contributes to high intelligence.

FR 04
The posterior semantic asymmetry (PSA): A brain electrical signature of semantic activation
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The present study replicates and extends the findings of Koppehele-Gossel, Schnuerch, and Gibbons (2016, Brain and Language, 157, 35-43) of a posterior semantic asymmetry closely tracking the time course and degree of semantic activation from visually-presented words. This asymmetry in event-related brain potentials was derived by subtracting right-side from left-side scalp-electrical activity obtained in a simple single-word reading paradigm. In line with our previous results, the PSA peaked around 300 ms after stimulus onset and reliably increased with increasing demands on semantic processing. As an important extension of previous findings, we used current source density (CSD) transformation. CSD analyses confirmed that the PSA originates from the left temporo-parietal cortex. Once more, the validity of the PSA as a measure of the effort required to activate word meaning was attested, as the meaning-specific portion of the PSA was smaller in participants with higher verbal intelligence. This was true even after controlling for nonverbal intelligence. Another novel finding was that, for pictorial stimuli, lateralized CSD transformed ERPs and their variation with processing demands were substantially different from the word-induced PSA, even though task conditions were otherwise identical.

FR 05
The Effect of Negative Motivation on the Autonomic Correlates of Deception
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In forensic contexts, lying is often motivated by the will to avoid negative consequences (e.g., an arrest). Previous research investigating the effect of motivation on deception has, however, nearly exclusively focused on the effect of positive motivation (e.g., the possibility to receive financial rewards). In the current study, we therefore aimed to investigate the influence of negative motivation on the autonomic correlates of lying. Participants committed a mock theft and then underwent a question procedure in which they had to both truthfully and deceptively answer questions about the actually committed mock crime and a control crime which was not committed. Half of the participants completed the question procedure without any specific motivation, whereas the other half of the participants was told that unsuccessful lying (i.e., lies detected by a computer algorithm) would result in a short unpleasant electric stimulation. Results revealed a larger differentiation between truth telling and lying in skin conductance responses in the negative motivation compared to the no motivation condition. Those results are in line with previously found effects of positive motivation on the autonomic correlates of information concealment and on verbal and non-verbal behavioral cues to deception, which have been explained by the motivation impairment hypothesis. They are, however, in contrast with effects of positive emotion on reaction time based deception measures. Potential explanations for those discrepancies as well as applied implications of our results will be discussed.

FR 06
Binge drinking increases conscious cognitive conflicts, but decreases subliminally induced ones
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It is a well-known fact that consuming large quantities of alcohol heavily impairs different cognitive faculties, especially executive functions and conflict monitoring / control. But while consciously initiated top-down behavior has been shown to be strongly impaired by acute alcohol intoxication, behavior which is rather automatic and bottom-up seems to be much less affected. Against this background, we investigated whether alcohol has differential effects on response conflicts arising from stimuli that are either subliminally or consciously perceived.

We asked n=22 healthy young male participants to perform a subliminally primed flanker task in a balanced within-subject design (i.e. sober vs. intoxicated at 1.1‰) while an EEG was recorded.
On the behavioral level, we found that an acute alcohol intoxication increased the conflict induced by consciously perceived distractors (i.e. the flankers), but decreased the conflict induced by subliminally perceived distractors (i.e. a masked prime). On the neurophysiological level, we found that the increase in consciously evoked conflicts was mainly evident at early attentional processing stages, as reflected by flanker effects in the early visual P1 and N1 components. In contrast to this, the reduction of subliminally induced conflicts was mainly reflected at later stages of conflict monitoring, i.e. by the central N2 component and variations at electrode Cz around the time of the parietal P3 peak. 

Taken together, our findings show that an acute alcohol intoxication differentially affects subliminally and consciously triggered conflicts. The implications of these findings are discussed.

FR 07
Does cognitive load enhance affective priming? An event-related potential study
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Following affective primes, evaluative judgments about neutral targets tend to systematically shift towards the valence of the primes. Prior research suggests that this affective priming effect (APE) increases when the primes are processed superficially rather than deeply. This is in line with the assumption that affect misattribution contributes to the APE. We experimentally varied the depth of prime processing during an AMP-like affective priming procedure by means of a concurrent working-memory task. 47 participants rated their liking of Korean ideographs following clearly visible affective prime words while EEG was recorded. In a within-subject design three levels of working-memory load were applied specifically during prime processing, to vary the amount of cognitive resources available. The APE was significant at all loads and unexpectedly even tended to decrease over loads, although efficiency of the load manipulation was confirmed by reduced amplitudes of posterior attention-sensitive prime ERPs. Prime ERPs further revealed greater explicit affective discrimination of the primes as load increased. This suggests that participants by default tried to inhibit the processing of the primes’ affect to enable unbiased target judgments. However this inhibition more often failed under high load, causing a breakthrough of affect. In the target ERP the medial-frontal positivity, a well-established marker of stimulus value, systematically varied as a function of prime affect, suggesting altered affective processing of the target (i.e., prime-target affect transfer). Our findings thus support affect misattribution as a major source of the overall APE but also point to the relevance of strategic control processes.

FR 08
The influence of top-down visual search strategies on attentional capture and inhibition. Evidence from a spatial cuing paradigm and the event-related potentials
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During visual search cognitive control mechanisms guarantee the selection of currently relevant information such as the recovery from attentional capture by irrelevant objects. By means of the event-related potentials (ERPs), we investigated how attentional capture and inhibitory processes are influenced by top-down visual search strategies. Participants performed a spatial cuing task where a target array was preceded by an irrelevant color singleton cue that was either contingent (color search) or non-contingent (shape search) on the attentional set. To trigger the adaptation of different search strategies, the target could be either identified by searching for a singleton or a specific feature. Independent of the search mode, spatial cuing effects were most pronounced in the contingent condition. The ERP findings provided evidence for two distinct search strategies: N2pc mirrored attentional capture by the irrelevant cue and was most pronounced for singleton search mode. Rapid reorienting of the attentional focus was indexed by a subsequent contralateral positivity referred to the color cue (i.e. distractor positivity; Pd). This early positivity did not vary between the search strategies. Inhibition of the irrelevant information was reflected by a second contralateral positivity after target presentation which was enhanced for the contingent condition of the feature search mode. Furthermore, fronto-central effects reflected reduced attentional capture and stronger inhibition of irrelevant information for the feature search mode. Altogether, the ERP findings speak in favor of enhanced cognitive control when feature search mode is adapted.

FR 09
The impact of stress on extinction retrieval of socially relevant fear associations
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Stress and the stress hormone cortisol have been reliably shown to reduce retrieval of emotional material in the domain of declarative memory. Few studies so far investigated the impact of stress hormones on retrieval of fear-associated memories. Repeated pairings of an aversive unconditioned stimulus (UCS) with a neutral stimulus lead to conditioned fear responses towards this now conditioned stimulus (CS+). To explore the impact of more socially relevant processes, in- and outgroup faces have been previously employed as conditioned stimuli. In the current study, we investigated how acute stress influences this social fear conditioning approach. During acquisition training, 40 healthy men were confronted repeatedly with two in- and two outgroup faces, one of each was coupled with an electrical stimulation (UCS), representing the CS+, whereas
the other was not paired with the UCS (CS-). During extinction training, all CS were presented again without UCS application. On the next day, participants were randomly assigned to a stress (socially evaluated cold pressor test) or a control condition. Between-group differences during extinction retrieval of in- and outgroup CS were tested after stress induction. Acute stress modulated extinction retrieval on the second day; whereas the control group showed a differentiation in skin conductance responses between in- and outgroup faces, stress reduced this differentiation. Overall, acute stress seems to inhibit the retrieval of combined socially and fear-relevant information, pointing to a similar underlying mechanism as in declarative memory.

FR 10
Stress Attenuates Frontal Theta Oscillations and Reward Learning from Immediate but not Delayed Rewards
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Preferences in choices can be acquired via dopaminergic midbrain neurons and the striatum or via the hippocampus. Reward delays reduce the striatal involvement in learning, which instead becomes more hippocampus-dependent. The reduction of striatal involvement in learning is reflected in a decreased feedback-related negativity (FRN) in the EEG.

Stress has been shown to influence learning and reward processing. However, while some studies reported stress to increase striatal and prefrontal dopamine availability and increase the FRN, other studies demonstrated an attenuation of reward processing and reward-related neuronal activations after stress.

The current study investigated how oscillatory and time-locked EEG components are influenced by stress and reward delay. Fifty males underwent a stressful or a control situation before they conducted a reward learning task. Based on immediate (0.5s) or delayed (6.5s) rewards, participants learned to choose between two stimuli, which were linked to a fixed reward probability (0, 20, 40, 60, or 80%). After their decision between two stimuli, they received either 0.20€ reward, or 0.10€ punishment in each trial.

Stress impaired the learning from immediate rewards, while groups differences were absent after delayed rewards. A decline in the FRN was found after stress and after delayed rewards.

These results demonstrate that stress modulates reward learning, and attenuates oscillatory and time-locked reward processing signals. This underlines that the interplay of stress and reward timing modifies the learning outcome and the processing of rewards.

FR 11
Die potentielle Rolle biologischer Marker zur Erfassung und Beschreibung von Burnout
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Burnout ist ein bereits vielbeschriebenes und vermutlich weit verbreitetes Stress-Phänomen. Im breiten Verständnis beschreibt Burnout einen tiefgreifenden Erschöpfungszustand, der auf eine langanhaltende chronische Stressbelastung am Arbeitsplatz zurückzuführen ist. Eine allgemein gültige Beschreibung, Definition oder Diagnose zu Burnout fehlt allerdings bis dato. Ebenso wenig ist bisher über mögliche biologische Korrelate bekannt, die einem Burnout-Verlauf vorausgehen oder einen solchen begleiten können. Im Rahmen der Dresdner Burnout Studie (DBS) wurden zu bisher zwei Erhebungszeiträumen (T1 und T2) Blut- und Haarproben sowie Selbstauskunftsdaten zu Burnout und Depression von insgesamt 920 Personen erhoben. Gesucht wurde nach möglichen Zusammenhängen der biologischen Marker (Haar: Steroidhormone; Blut: Differentialblutbild) und Burnout, die sich nicht ebenso gut durch dahinterliegende depressive Symptome erklären lassen. Langfristiges Ziel der DBS ist die Erfassung und Beschreibung eines Burnout-typischen Verlaufs anhand von Biomarkern. Der Vortrag fasst die Ergebnisse der ersten zwei Jahre dieser für 12 Jahre ausgelegten, prospektiven Längsschnitstudie zusammen und diskutiert deren mögliche Relevanz für einen biologisch fundierten diagnostischen Ansatz des Burnout-Syndroms.

FR 12
Are variants of the acetylcholine receptor gene CHRNA5 beneficial or not for subjects with features of ADHD?
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The impairment of attention, combined with impulsivity and hyperactivity, are key symptoms of attention deficit hyperactivity disorder (ADHD). ADHD is a complex disorder, mostly determined by biological factors and displaying a considerable amount of heterogeneity. Endophenotypes such as response inhibition might increase the chance of finding genetic associations with the disorder. Therefore, our aim was to investigate the relationship between response inhibition, ADHD and variants of the acetylcholine receptor gene CHRNA5.

A total of 183 participants (mean age 25.66 ± 11.02, 52.5 % female) were included, ADHD-status determined using the ADHS-SB questionnaire. Response inhibition and speed were measured with the Stop Signal Task. Two CHRNA5 variants, rs3841324 (S/L alleles) and rs16969968 (G/A alleles), were genotyped. A MANCOVA was carried out using response speed and response inhibition as dependent
variables; sex, ADHD status and CHRNAS genotypes as independent variables. We found that carrier of the minor S-allele scoring high on ADHD showed increased response speed ($F = 2.947; p = 0.056; \eta^2 = 0.038$). Further, in the combined S5_GG genotype, women exceeding the ADHD cut-off were slower than men, while in participants below the cut-off, women were faster than men ($F = 5.313; p = 0.023; \eta^2 = 0.034$). There were no significant interactions with response inhibition.

For women with features of ADHD, the CHRNAS genotype S5_GG seems to be a risk factor as it increases their response speed and therewith reinforce their hyperactivity/impulsivity symptoms, for male carriers with ADHD symptoms, a beneficial effect might be suggested.

**FR 13**

Circadian effects of automatic visuo-motor priming in RLS patients— an EEG source localization study

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The restless legs syndrome (RLS) is a sensory-motor disorder and the symptoms pronounce most strongly in the evening and at night. In spite of the circadian variation of sensory and motor symptoms, potentially associated diurnal changes of dopamine-regulated cognitive performance such as automatic visuo-motor priming have not yet been investigated in RLS patients. It is unclear whether RLS patients show deficits in the automatic response activation, and whether these deficits are enhanced in the evening akin to sensory and motor symptoms. Moreover, the underlying neurophysiological and functional neuroanatomical processes are elusive. To investigate this, we applied EEG in combination with source localization methods (sLORETA) to examine daytime effects (morning vs evening) in RLS patients compared to healthy controls using a Simon task. RLS patients performed better in the evening than in the morning, which was reflected by the neurophysiological data with a less positive initial early LRP (e-LRP) in the evening compared to in the morning. This finding suggests that RLS patients benefit from an intensified impairment of location-based automatic response activation in the evening which is mediated via networks consisting of superior parietal cortex and premotor cortex. In contrast, controlled response selection as well as early attentional processing seems unaffected by RLS. The daytime-dependent impairment in visuo-motor priming may be attributed to disruptions in dopaminergic transmission and changed dopamine-related circadian rhythms of RLS patients.

**FR 14**

Imaging memory transformation: neural signature of detailed and gist-like memories of recent and remote events

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Over time, memories undergo a neural reorganization. Yet the exact nature of this reorganization is still debated. According to the Standard Consolidation Theory, memories are gradually consolidated from the hippocampus to the neocortex until they are ultimately independent of the hippocampus. The Memory Transformation Hypothesis, however, postulates that memories undergo a transformation from detailed, episodic to gist-like, semantic representations that can be retrieved solely from the neocortex, whereas the detailed episodic memories would always remain hippocampus-dependent. This experiment contrasted these views and tested the transformation of episodic memories as well as the neural changes associated with the temporal dynamics of memory. Participants encoded pictures and performed a recognition test in the MRI scanner either 1 day or 28 days later. Critically, the recognition test contained, in addition to the original and entirely novel pictures, similar pictures carrying the gist of the original ones, thus allowing us to assess the specificity of memory. Overall, memory performance after 28d was reduced compared to 1d but was still mainly intact. Twenty-eight day old memories, however, were characterized by a striking lack of specificity reflected in a significantly elevated false alarm rate specifically for similar pictures, thus suggesting a transformation to more gist-like memories. Imaging data showed significantly reduced hippocampus and entorhinal cortex activity after 28d (vs. 1d), whereas activity in most neocortical regions of interest did not differ. Multivariate imaging analyses targeting the hippocampal and neocortical representation of recent and remote memories are currently being performed and will be presented at the meeting.

**FR 15**

Specific neurophysiological mechanisms underlie cognitive inflexibility in inflammatory bowel disease

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Inflammatory bowel disease (IBD) is highly prevalent. While the pathophysiological mechanisms of IBD are increasingly understood, there is a lack of knowledge concerning cognitive dysfunctions in IBD. This is all the more the case concerning the underlying neurophysiological mechanisms. In the current study we focus on possible dysfunctions of cognitive flexibility (task switching) processes in IBD
patients using a system neurophysiological approach combining event-related potential (ERP) recordings with source localization analyses. We show that there are task switching deficits (i.e. increased switch costs) in IBD patients. The neurophysiological data show that even though the pathophysiology of IBD is diverse and wide-spread, only specific cognitive subprocesses are altered: There was a selective dysfunction at the response selection level (N2 ERP) associated with functional alterations in the anterior cingulate cortex and the right inferior frontal gyrus. Attentional selection processes (N1 ERP), perceptual categorization processes (P1 ERP), or mechanisms related to the flexible implementation of task sets and related working memory processes (P3 ERP) do not contribute to cognitive inflexibility in IBD patients and were unchanged. It seems that pathophysiological processes in IBD strongly compromise cognitive-neuropsychological subprocesses related to fronto-striatal networks. These circuits may become overstrained in IBD when cognitive flexibility is required.

FR 16
An ERP study of induced mental fatigue and task switching
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Mental fatigue is described as the effect that people experience from prolonged periods of cognitive activity. It is strongly linked to the quality of work productivity due to impairments in cognitive functioning. However, despite the fact that long-lasting execution of cognitively challenging tasks are present in a vast field of every day work tasks, neural mechanisms accompanying behavioral deterioration are poorly understood. In this study, we induce mental fatigue in young healthy adults in a 3 hours continuous demanding switch task performance. Our objective is to provide evidence for altered brain activity during switching between tasks over time. We present data showing effects of mental fatigue have specific effects on response selection mechanisms (N2 and P3 ERPs), but not on attentional selection processes. The data suggest that switching processes undergo strong declines in early time on task periods, opposed to later periods in the experiments. Short breaks do not fully restore cognitive flexibility processes.

FR 17
Content specific properties of the norepinephrine system in cognitive control – Evidence from EEG and pupillary responses
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The efficiency of cognitive control, as a major function of the prefrontal cortex, is modulated by the phasic release of norepinephrine (NE) at specific time points. Usually, different aspects of information require simultaneous processing at a certain time point. It is unknown whether the NE system is able to specifically modulate different aspects of ongoing information processing, even if the same functional neuroanatomical structures are involved. This question was examined using a flanker paradigm by integrating EEG and pupil diameter data and applying signal processing techniques including Residue Iteration Decomposition (RIDE) as well as source localization. The results show, that the NE systems modulates motor-response related processes stronger than stimulus-related or central decision processes in action control. More interesting, this modulation was evident even though these processes overlapped in time and were mediated by overlapping medial-frontal cortical structures. In sum, the NE system specifically modulates different aspects of information which are processed at the same point in time in medial-frontal cortical areas.

FR 18
Neuronale Korrelate von Effekten vorausgehender negativer Kontextinformation auf die Emotionserkennung
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Die korrekte Identifikation emotionaler Gesichtsausdrücke stellt eine grundlegende Voraussetzung für adäquate soziale Interaktion dar. Negative Verzerrungen in der Emotionserkennung sind charakteristisch für verschiedene psychische Erkrankungen und können zu Einschränkungen im sozialen Funktionsniveau führen. Eine starke Interferenz durch Kontextinformationen, die für die eigentliche Interpretation der aktuellen Situation irrelevant sind, könnte eine Erklärung für die Entstehung eines negativen Bias in der Emotionswahrnehmung sein.
Zur Untersuchung der neuronalen Korrelate eines solchen Mechanismus, wurde eine funktionelle Magnetresonanztomografie-Studie durchgeführt. In dieser wurde ein Emotionserkennungsparadigma angewendet, in dem die 31 gesunden Teilnehmer sowohl emotionale als auch neutrale Gesichtsausdrücke, denen entweder ein neutrales
oder negatives soziales Szenenbild vorausging, hinsichtlich ihrer Valenz beurteilten.
In der Beurteilung positiver Gesichtsausdrücke trat ein negativer Bias durch negative vorangehende Kontextinformation auf, nicht jedoch bei neutralen und negativen Gesichtsausdrücken. Auf neuronaler Ebene zeigte sich eine verstärkte Aktivierung in Amygdala, Nucleus Accumbens und superiorem temporalen Sulcus in Reaktion auf neutrale Gesichter, denen ein negatives Szenenbild vorausging. Für positive und negative Gesichtsausdrücke zeigte sich in diesem Vergleich jeweils eine differentielle Aktivierung in Nucleus Accumbens (negative Gesichter) und superiorem temporalen Sulcus (positive Gesichter). Ein stärkerer negativer Bias durch ein negatives Szenenbild war zudem mit einer erhöhten Aktivierung im Brodmann Areal 44 assoziiert.
Die Ergebnisse sprechen dafür, dass der Einfluss aufgabenirrelevanter, negativer Kontextinformation bei gesunden Personen die Beurteilung positiver Gesichtsausdrücke negativ verzerrt und sich auf der sensitiveren neuronalen Ebene in spezifischen Aktivierungsveränderungen für die verschiedenen Gesichtsausdrücke zeigt.
FR 19
Applying the Affective Neuroscience Framework for the molecular study of Internet and Smartphone Addiction: Preliminary results
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The current study aims at applying a recently proposed Affective Neuroscience Framework (ANF, Montag et al., 2016), providing a roadmap for the molecular study of Internet addiction. Based on it, a SNP on the Prolactin (PRL) gene was investigated in the context of Internet and Smartphone addiction. In the context of ANF, PRL has been proposed to play a role for the brain emotional systems of SADNESS and CARE.

N=567 participants (166 males) filled in the Generalized-Problematic-Internet-Use-Scale 2 (GPIUS-2), the Smartphone-Addiction-Scale (SAS) and the Affective Neuroscience Personality Scales (ANPS), and provided buccal swaps for genotyping rs1205960 and rs13354826, located on the PRL and PRLR (prolactin receptor) genes. The SAS subscale “cyberspace-oriented relationships” and the GPIUS-2 subscale “mood regulation” showed one of the highest positive correlations with the SADNESS system (rho=.16, p<.001 and rho=.25, p<.001 respectively). Furthermore, high scores on these scales were significantly associated with the TT-genotype of rs1205960 compared to C(+-)-allele carriers (U(533,32)=6226.5, p<.05 and U(532,32)=6354.0, p<.05 respectively). Male participants triggered these results. The TT-genotype was also significantly linked to higher scores in SADNESS (MC(+-)=36.97 and M(C(+))=34.83, F(1, 562)=6.312, p<.01). The results are limited due to the small group of TT carriers, resulting in 32 participants (ca. 6% of the complete sample). No significant associations were found for rs13354826.

Although these results need to be considered as preliminary, they provide first evidence for applying the ANF in the context of Internet and Smartphone addiction. The present sample is currently enlarged to test the robustness of the presented effects.

FR 20
Investigating trial-by-trial modulation of performance in different feature repetition conditions
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In spatial stimulus-response compatibility tasks, a conflict of stimulus and response locations (non-corresponding) leads to longer response times. This effect is reduced when the previous trial is also non-corresponding. Such sequential effects are often explained by a trial-by-trial adaptation of cognitive control. However, feature integration effects as well as priming effects can also explain the observed phenomenon. Here, a Simon task with four stimuli mapped to two response locations (non-corresponding) was used, which allowed a fine-grained analysis of feature integration effects. As the stimulus changes independently from the response, feature integration and conflict adaptation effects are no longer confounded. Reduced Simon effects after non-corresponding trials were evident. In the electrophysiological data, however, neither the fronto-central N2, a marker for cognitive control, nor the parietal P3, an index of response selection processes, were sequentially modulated by the previous correspondence. The analysis of the feature integration effects showed that response times and accuracy were differently affected by feature overlaps. Additionally, an increased parietal P3 was found when the response as well as the stimulus changes. Compared to all other sequences reduced cognitive control (N2) was found only in sequences, which neither involved a change of features nor a conflict. Overall, the data indicate that not only the repetition of integrated feature representations, but rather the repetition of single features modulates performance. The observed pattern seems not to be explainable by one theory alone.

FR 21
Der Einfluss des COMT Val158Met Polymorphismus auf selbstberichtete Aufmerksamkeitskontrolle, Achtsamkeit und alltägliche kognitive Fehler
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FR 22
Stress and Decision Making under Uncertainty: An Event-Related Potential Study

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Research on stress and its influence on decision making has recently become a relevant topic. Often decision making takes place under uncertainty (the probabilities of possible outcome alternatives are unknown) and under acute stress conditions. A recent hypothesis states, that acute stress leads to more risky behavior, because stress changes the quality of feedback processing, which is the only mechanism to evaluate decisions under uncertainty.

The current study investigated if acute stress leads to altered feedback processing and therefore to riskier and more reward seeking decisions in the Balloon Analogue Risk Task (BART). Furthermore, the influence of stress on the neural correlate of decision making, the Feedback Related Negativity (FRN), was examined via recording of event-related potentials from 61 electrodes during the BART. Stress was induced in 22 participants by the Social Evaluated Cold Pressure Task (SECPT) and stress levels were assessed with questionnaires and salivary cortisol measurements at seven time points during the experiment. Subsequently, participants were assigned with regard to their cortisol reaction in a high or low cortisol responder group. Ten control subjects were examined in the same way, but instead of the SECPT, they received the same procedure with hand warm water. Contrary to previous research, our results indicate that stressed subjects reacted less risky, especially at higher risk levels with no differences in the FRN between the experimental stressed groups and the control group. A consequence of our results is the suggestion to look more closely to the covariation of psychological and biological stress measures.

FR 23
Mobile brain/body imaging (MoBi) of spatial knowledge acquisition during unconstrained exploration in virtual reality (VR)

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The neuroscientific study of human navigation has been constrained by traditional brain imaging approaches requiring subjects to remain stationary. Such imaging approaches neglect a central component characterizing navigation – the multisensory experience of self-movement. Navigation by actual walking heavily relies on idiothetic cues, i.e. information originating from navigators’ movements as well as allocthic cues, i.e., information about objects and space unaffected by changes in body position and orientation. A well-established theory of spatial learning in children assumes an ontogenetic sequence from egocentric (body-centered) to allocentric (external world-centered) representations of space implying a sequential development from coarse to complex spatial representations. We leveraged a Mobile Brain/Body Imaging (MoBi) approach collecting synchronized high-density EEG and full body motion capture in an interactive sparse virtual reality (VR) setup. Subjects explored an invisible maze by real walking, visual exploration, and reaching for walls and doorways. Wall touches elicited sparse, discrete visual feedback percepts providing the basis for event-related data analyses approaches to investigate EEG effective source- and sensor-level dynamics. We analyzed movement data to mark and quantify events of navigation behavior and describe ongoing processes of spatial knowledge acquisition. These descriptors were used as a weighting of the instantaneous behavior with respect to its spatial information content. The analyses focused on validating existing models of spatial knowledge acquisition and the comprehension of spatial representations. The present results of the ongoing study indicate (a) sufficient data quality to employ computational data analyses and mining procedures and (b) substantial findings regarding human spatial cognition.

FR 24
Neuronal correlates of feedback processing in a reversal learning task in relation to the need for cognitive closure

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The need for cognitive closure (NFCC) refers to a motivational state in which people seek to close open decision situations and fill knowledge gaps quickly, in order to escape from the ambiguity associated with such situations. This need cannot only be conceptualized as a state, but also as a stable personality trait. Participants with a high NFCC initially show more information seeking behavior (seizing) and subsequently stick to the resulting decisions and inferences longer (freezing). The present study investigated neuronal correlates of freezing in relation to NFCC. Twenty-seven participants completed a probabilistic reversal learning paradigm. The feedback-related negativity (FRN) and P300 were analyzed as neuronal correlates of feedback processing. We found no relation between NFCC and the number of perseveration errors. However, the FRN difference between negative feedback following rule reversal and valid positive feedback correlated positively with NFCC. An additional exploratory analysis of response-related event-related potentials showed a significant negative correlation between the error positivity and NFCC. Taken together, the electrophysiological results suggest that participants with increased NFCC are less aware of their errors, which fits with an increased freezing tendency. Nevertheless, they can still use external feedback to appropriately adapt their behavior.
FR 25
VR Diagnostic Tool For Social Anxiety: A Pilot Study
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The potential of virtual reality for diagnosing anxiety disorders has been explored to a lesser extent than its use in psychotherapy so far. The current study applied virtual environments as an innovative diagnostic tool for social anxiety and social anxiety disorder and examined differences between low- and high-socially-anxious participants on the basis of specific psychological parameters and recordings of gaze behavior. Out of 119 subjects, 19 low- and 18 high-socially-anxious participants were selected by a social anxiety questionnaire. During the completion of eight tasks in a virtual train and waiting room scenario, the skin conductance response and gaze behavior was monitored. The findings indicate that analyzing fixation durations of faces in a virtual social situation is even more suitable for distinguishing low- and high-social-anxious participants than investigations of skin conductance responses.

FR 26
Respiration pattern variability, depression, and the default mode network
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Studies with healthy participants and patients with respiration related disorders suggest a relation between altered respiration and mood. The aim of the present analyses was to investigate whether emotionally challenged remitted depressed patients (rMDD) show higher respiration pattern variability (RPV) and whether this is related to mood, clinical outcome and default mode network connectivity, a neural marker of depression.

To challenge participants, sad mood was induced with keywords of personal negative life events in rMDD (n=30) and matched healthy controls (n=30) during fMRI. Respiration was measured by means of a built-in respiration belt. Additionally, questionnaires, a daily life assessment of valence and a 3 years follow-up were applied. For replication, we analysed an independent sample of 53 rMDD who underwent the same paradigm.

In both samples, rMDD showed greater variability in their respiration patterns, e.g. higher variability in respiratory pause duration and in addition higher main respiration frequency and lower outbreath to inbreath ratio. Higher RPV was related to lower daily life valence and predicted higher depression scores and even relapses after 3 years. Furthermore, in rMDD higher main respiration frequency was linked to greater connectivity of the posterior cingulate cortex and the parahippocampal gyrus.

The results suggest a relation between RPV, mood and depression on the behavioural and neural level. Based on these findings, we assume that a main respiratory problem of MDD can be found in the out-breathing part of the respiration cycle. Interventions focusing on respiration might provide a useful additional tool in the treatment of depression.

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FR 27
Oscillatory brain activity mirrors different mnemonic mechanisms during multiple item repetition
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Mnemonic processes are accompanied by changes in oscillatory brain activity, e.g. in the theta (4−7 Hz) and gamma band (> 25 Hz). Recent studies applied “old/new” recognition designs and revealed that gamma oscillation might reflect the activation of object-related memory traces, while theta band activity is attributed to executive control functions. We intended to increase the validity of these findings by repeating “old” items not only once but several times. To that end, we performed high-density EEG recordings during a continuous “old/new” recognition task with up to four repetitions per item (mean item repetition at ~10/sec). We examined spectral amplitudes and cross-frequency coupling between theta phases and gamma amplitudes with repetition count as independent variable.

We found an increase of theta amplitudes from the initial presentation to the first repetition. Interestingly, theta amplitudes dropped to the level of the initial presentation after the second repetition. In contrast, the coupling of theta phase to gamma amplitudes at fronto-central sites decreased with the second repetition but linearly recovered to its initial values with further presentations.

Conclusion: (1) Theta power does not merely mirror genuinely retrieval-related control functions but changes in response behavior from a “new” to an “old” response. (2) Cross-frequency coupling might not only indicate the interaction of executive control functions on cortical object representations but also a transition from explicit to implicit processing strategies after multiple item repetitions.

FR 28
Sleep supports systems memory consolidation in hippocampus and posterior parietal cortex
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Memories undergo a transitional process termed systems memory consolidation to allow flexible learning as well as stable long-term storage. This is supposed to be driven by a change in the neural substrates supporting new memories. Though sleep is thought to...
foster systems consolidation, we recently showed the rapid emergence of a posterior parietal memory network for a spatial memory task while memory became increasingly independent of the hippocampus. To investigate whether fast transitions in neural activity also occur for non-spatial learning and, importantly, whether sleep is necessary for transitions to be stabilized, we tracked neural activity of 32 subjects over learning repetitions by fMRI. Subjects repeatedly studied a wordlist and came back for a second session 12 hours later, spending the time in either asleep or awake. During the second session, subjects again studied the original wordlist, with half of the words replaced by new ones. We identified systems consolidation as a transition of task-evoked neural activity from hippocampus to posterior parietal regions induced by repeated learning. These rapid changes in hippocampal contribution were stabilized over sleep, whereas wakefulness led to a reset of hippocampal activity. Our findings demonstrate the distinct paths memories take over consolidation during sleep and wakefulness. They indicate a fast transition in memory systems contributions from a hippocampal encoding system to a posterior parietal long-term memory storage, which develops over learning repetitions. The maintenance of this shift in memory systems, however, depends critically on sleep.

FR 29
Defensive Mobilisierung auf interzeptive Bedrohung bei Patienten mit Panikstörung vor und nach expositionsbasierter Verhaltenstherapie
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FR 30
CONDITIONED PAIN MODULATION (CPM) – MORE THAN JUST HABITUATION? AN EXPERIMENTAL TEST OF SEQUENCE EFFECTS
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Background and aims: Conditioned pain modulation (CPM) is an experimental paradigm capturing endogenous pain modulation which has gained importance due to its association with clinical pain. CPM describes the inhibition of the pain response to a test stimulus (TS) by the concurrent application of a second noxious stimulus, the conditioning stimulus (CS). However, by standard the baseline condition (TS alone) is always presented prior to the CPM condition (TS + CS) so that pain inhibition could be simply due to habituation.

Methods: Sixty healthy subjects (female: N = 34) underwent two CPM test blocks: one standard block (baseline – CPM) and one reversed block (CPM – baseline) separated by a 20 minute break. The sequence of the two blocks was balanced across subjects (standard first: N = 26). TS were heat stimuli applied to the left forearm via a contact thermode; we assessed a) pain threshold and b) ratings of fixed intensity stimuli (48 °C). Immersion of the right hand in a cold water bath served as CS.

Results: We found no effect of block (first vs. second test block). In addition, there was no effect of CPM condition (standard vs. reversed) for pain ratings; however, we observed a tendency towards more efficient CPM in the standard condition for pain threshold.

Conclusions: Our results suggest that the CPM effect might be partly explained by habituation, particularly when pain threshold is assessed as outcome. Future research should systematically explore sequence effects on CPM for different stimulus modalities and outcome measures.

FR 31
Attentional Bias Modification in Social Anxiety: Effects on the N2pc component.
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Attentional bias toward threat may have a causal influence on the emergence and persistence of anxiety because its modification is accompanied by concurrent changes in symptomatology (Mogoașă, David, & Koster, 2014). Attentional Bias Modification Training (ABMT) might therefore be a promising tool to efficiently enhance existing treatment effects (Bar-Haim, 2010) and even serve as a preventative measure by reducing vulnerability to anxiety (See, MacLeod, & Bridle, 2009).
However, it is still unknown what kind of changes ABMT initiates inside the brain. We conducted a randomized control trial with a large sample of socially anxious participants and measured changes in the N2pc component pre, post, and 11 weeks following up the intervention consisting of eight sessions of ABMT or placebo procedure. We found a decrease in attentional deployment toward angry compared to neutral faces as reflected by the N2pc. This modification, however, was not specific for ABMT but also occurred within the placebo procedure (a standard Dot Probe Paradigm). Effects on anxiety symptoms were heterogeneous for different questionnaires and divergent from changes in brain activity. The data suggest that changes of attentional bias as indexed by activation inside the primary visual cortex are not specific to attentional modification training but also occur during mere exposition to threatening stimuli (cp. De Voogd et al., 2017). Reliability issues and hemispheric differences are discussed.

FR 32
Inter-individual differences in trait anxiety shape BNST-amygdala coupling during brief threat processing
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There is an ongoing debate on whether the amygdala and the bed nucleus of the stria terminalis (BNST) are differentially involved in phasic and sustained responses to threat. Recently, it has been proposed that the role of the BNST is not limited to sustained threat contexts. Amygdala and BNST seem to work in concert in the processing of briefly presented threat-related stimuli. However, this assumption has not been tested in human research and it remains unknown in how far inter-individual differences in trait anxiety moderate phasic responses and functional connectivity of amygdala and BNST during threat processing. Using event-related functional magnetic resonance imaging, we investigated activation and functional connectivity of amygdala and BNST, as well as modulating effects of trait anxiety, during processing of briefly presented threatening relative to neutral pictures in a large sample of 93 healthy subjects. Both amygdala and BNST activation was increased during presentation of threat relative to neutral pictures. Furthermore, functional connectivity between BNST and amygdala was found to be positively associated with trait anxiety. These findings suggest that amygdala and BNST form a functional unit during phasic threat processing and that their functional connectivity is shaped by inter-individual differences in trait anxiety.

FR 33
Changes of empathic responding after insular and sub-insular damage
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Neuroimaging research has highlighted the insular cortex (IC) as a key structure not only enabling representation of personal emotional states, but also contributing to the prediction of emotional states in others. Although reductions of empathic responses following insular damage have correspondingly been observed in a few case studies, there is also single-case based evidence for empathic deficits following damage to frontotemporal IC connections rather than the IC itself. The present study aimed to elucidate consequences of insular and sub-insular brain damage on empathic responding in a paradigm of high external validity that addressed two distinct components of empathy, i.e., emotional and cognitive empathy. Eighteen patients suffering from focal IC damage, 8 patients with damage to sub-insular white-matter compartments and 23 healthy controls were shown 16 videos displaying individuals telling a personal life event and asked to continuously rate either their own emotional reaction (emotional empathy) or how they perceived the affective state of the story teller (cognitive empathy). Statistical analyses yielded a significant group effect, showing significantly reduced empathic responses in the IC-damaged patients, when related either to patients with sub-insular damage or healthy controls. The effect was not associated with cognitive functioning in the IC-damaged group. Moreover, lesion laterality did not affect empathic responding among patients with IC-damage. Our results strengthen the IC in its role as the central neuroanatomical structure underlying emotional and cognitive empathic processes.

FR 34
Reduktion des Stroop-Effektes mit posthypnotischen Instruktionen – Replikation und Erweiterung einer EEG-Studie
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Universität Trier, Deutschland

Mithilfe posthypnotischer Suggestionen kann eine Reduktion des Stroop-Effektes erzielt werden. Der vorliegenden Studie lag die Intention zugrunde diese Ergebnisse zu replizieren und zu erweitern. 24 Probanden, die das gesamte Spektrum der Suggestibilität abdeckten (erfasst durch Harvard Group Scale & Stanford Hypnotic Susceptibility Scale), absolvierten drei Stroop-Tasks mit 144 Reizen (48 konsistente, 48 inkonsistente und 48 neutrale Stimuli). Im Anschluss an den ersten Stroop erhielten die Probanden eine standardisierte hypnotische Induktion, gefolgt von einer neutralen Leertour. Darauf schloss sich die Suggestion an, die Teilnehmer seien nicht mehr in der
Influences of Stimulus Salience on Visual Mismatch Negativity in a Roving Oddball Paradigm

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While the existence of the visual counterpart of the auditory mismatch negativity has been established in the last decades, several open questions concerning modulatory influences on visual mismatch negativity (vMMN) still remain a topic of ongoing debate. In particular, the influence of stimulus salience on vMMN has not yet been investigated systematically. From a methodological perspective, the often used standard oddball paradigm has been criticized as it confounds stimulus frequency with low level stimulus features if not otherwise controlled. In this study, we tested 22 subjects with a roving oddball paradigm while manipulating stimulus salience from line segments, while the subjects solved an attention demanding task in a sequence of three different geometrical figures made up of line segments. ERP amplitudes were clearly modulated by physical properties and do not differ in overall frequency. We presented stimulus sequences of three different geometrical figures made up of line segments, while the subjects solved an attention demanding color-discrimination task. Salience was manipulated by varying the length of the lines. ERP amplitudes were clearly modulated by salience, while no effect on the vMMN could be observed. Independently of salience, a negative difference between deviant and standard stimulus was observed at posterior electrodes 150 to 200 ms after stimulus onset. In this study, we could thus demonstrate the viability of the roving oddball paradigm for the elicitation of vMMN. However, the influence of stimulus salience on automatic deviance detection remained unresolved.

Endocrine modulation of value representations in mesocorticolimbic circuits following short-term fasting

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Dopaminergic neurons in the SN/VTA are activated in response to reward-predicting cues. SN/VTA neurons also express growth hormone secretagogue receptors for the stomach-derived orexigenic hormone ghrelin. Subjective reward values during value-based decisions are represented in the vmPFC and the OFC. After short-term fasting of 4 hours, subjective values of snack foods correlate with vmPFC activity. However, it is unclear if this correlation between neural activity and subjective values after short-term fasting is influenced by homeostatic hormones such as ghrelin. We investigated whether brain activity in mesolimbic and medial frontal regions in response to visual food cues is modulated by plasma ghrelin levels. Therefore, we took blood samples from 32 lean, healthy participants immediately before they underwent an fMRI food decision making task in a sated state or after short-term fasting of 8 hours in a randomized, within-subject design. We found that plasma levels of ghrelin as well as subjective hunger ratings were significantly increased in the fasted compared with the sated condition. Functional MRI revealed that subjective value representations for snack foods in the SN/VTA and the mOFC were correlated with the intra-individual increase in ghrelin levels between the sated and the fasted condition. These findings demonstrate that reward in responses to food cues is influenced by homeostatic hormone levels, highlighting the close link between reward circuits and homeostatic circuits. Furthermore, our results could help to understand dysfunctional reward processing in people suffering from homeostatic dysregulation due to obesity.
consumption with (1) model-based goal-directed and model-free habitual control in a two-step sequential decision-making task while undergoing functional magnetic resonance imaging, and behavioral parameters of (2) delay discounting, probability discounting for (3) gains and (4) losses, and (5) loss aversion in 198 eighteen-year-old social drinkers. Additionally, we assessed participants’ drinking behavior twelve months after baseline. There were no convincing associations of alcohol consumption with behavioral control strategies and value-based decision making on a cross-sectional or longitudinal level. We could replicate fMRI findings of correlates of habitual and goal-directed control in ventral striatum and ventromedial prefrontal cortex, but they were not correlated with alcohol drinking behavior. While the ongoing follow-up assessments over the next years might reveal associations on a greater time scale or with more pronounced patterns of risky drinking, current findings do not speak for a role of these constructs as valuable predictors of non-pathological alcohol consumption per se.

FR 38
Rapid modulation of sensory distractor processing induced by response conflict
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Understanding the neural processes that maintain goal-directed behaviour is a major challenge for the study of selective attention and cognitive control. Much of the previous work on the issue has focused on prefrontal and parietal brain areas that are believed to be responsible for the identification of response conflict and the regulation of cognitive control. However, little is known about the dynamics of sensory and attentional brain processes induced by response conflict. An EEG study is reported that examined brain oscillatory activities invoked in the processing of response conflict, focusing on the effects of response conflict on the sensory processing of irrelevant distractor information. A lateralized single flanker task was used in which target letters were presented in the centre of the screen and single distractor letters were presented either left or right to the targets. Distractors could be response compatible or response incompatible with the responses to the targets. Behavioural results showed that responses to targets in response-incompatible trials were slower and more error prone than in response-compatible and neutral trials. Physiological results revealed an early effect in lateralized theta power over occipital electrodes with stronger lateralization in response-incompatible trials than in response-compatible and neutral trials. The occipital lateralization effect preceded in time the dominant main effect of response conflict over mid-frontal electrodes, as indicated by induced theta power increase. The findings indicate that attentional distraction may be the key initial trigger for the temporal cascade of processes by which the human brain responds to and regulates response conflict.

FR 39
First steps towards using functional near-infrared spectroscopy (fNIRS) recordings of mental arithmetic for the detection of residual cognitive activity in patients with disorders of consciousness (DOC)
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Besides EEG and fMRI, functional near-infrared spectroscopy (fNIRS) has recently been proposed as a promising approach for awareness detection, and as a possible method to establish basic communication in patients with disorders of consciousness (DOC). Using fNIRS, the present study aimed to evaluate the applicability of auditory presented mental arithmetic tasks in this respect. The auditory pathway was chosen as it is usually one of the last remaining input channels in DOC patients. At first, we investigated the applicability of active attention to serial subtractions for awareness detection in a group of healthy controls (HC), by comparing the measured patterns to patterns induced by self-performance of the same task. Furthermore, we examined the suitability of ignoring the given task as an additional control signal to implement a two class (attend vs. ignore) Brain-Computer-Interface (BCI) paradigm. Finally, we compared our findings in HC with recordings in two DOC patients. Results of the HC revealed no differences between the self-performance and the attention condition, making the attention task suitable for awareness detection. However, there was no general difference between the ignore and the attend condition, making the tasks less suitable for BCI control. Unexpectedly, we further did not find consistent correlation between the patient data and the HC group. Nevertheless, the inspection of single runs of the patient recordings revealed task-synchronous patterns pointing towards an, at least partly, active participation to the tasks. Therefore, further investigations are necessary to explore these findings, and its applicability for awareness detection in more detail.

FR 40
Mit einem bitteren Nachgeschmack – Veränderte Verarbeitung von Nahrungsmittelbildern bei bitterem Geschmack bei der Binge-Eating Störung
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Ein bitterer Geschmack, der ein Hinweisreiz auf potentiell Giftiges oder Verdorbenes ist, reduziert den Belohnungscharakter von

FR 41
Frontostriatal Connectivity: A Transdiagnostic Mechanism cutting across Depression and Alcohol Dependence?
Alena Becker (1), Martin Fungisai Gerchen (1), Martina Kirsch (1), Bettina Ubl (1), Sivaniya Subramaniampillai (2), Carsten Diener (3), Falk Kiefer (1), Christine Kuehner (1), Herta Flor (1), Peter Kirsch (1)

Dimensional models in clinical neuroscience acknowledge the high comorbidity of mental disorders and propose to study shared neurobiological markers across diagnostic categories. Reward processing is among the most promising neurobiological risk mechanisms in depression and alcohol dependence. To elucidate differences and similarities in neural reward processing between both disorders, we investigated 20 alcohol dependent patients, 20 depressed patients and 20 healthy controls by means of a functional magnetic resonance imaging (fMRI) monetary reward paradigm. In comparison to depressed and healthy individuals, alcohol dependent patients showed increased activation of the ventral striatum during the anticipation of reward. In contrast, both patient groups showed reduced frontostriatal connectivity compared to healthy controls. However, there is a high comorbidity between alcohol dependence and depression, challenging the idea of opposite mechanisms. To elucidate neural reward processing mechanisms underlying the comorbidity of alcohol dependence and depression, we further conducted a pilot study comparing at-risk individuals prone to alcohol dependence and depression (N=15) with individuals prone to depression only (N=16) and healthy controls (N=17). Using the aforementioned reward paradigm, we found that individuals prone to both alcohol dependence and depression showed decreased activation in the dorsal striatum in addition to decreased functional connectivity between the striatum and dorsolateral prefrontal cortex. While the frontostriatal connectivity results replicate the common pattern found for the patient groups, the activation results indicate a more depression-related pattern in individuals prone to both disorders. In conclusion, aberrant frontostriatal connectivity might be a promising transdiagnostic neurobiological marker for depression, alcohol dependence and their comorbidity.

FR 42
Memoria ex Machina: Real memory from virtual reality – An EEG study
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“‘Real-life’ autobiographical memory is characterized by self-involvement and rich associative mnemonic networks. Concerns have been raised that conventional ‘laboratory memory’ differs from these vivid experiences. We addressed these concerns by comparing retrieval-related EEG-indices of both forms of memory. Furthermore, we aimed at bridging the gap between both types of remembrance by adding a virtual reality (VR) encoding condition. Participants took either part in a (a) real car drive, were confronted with a (b) 360° VR, or (c) a 2D video of the same ride. An unannounced recognition memory task followed 48 hours after encoding. ERPs revealed that the retrieval of real-life and VR experiences is processed similarly, whereas both differ from the retrieval of conventional laboratory-events. Within the 2D condition, we replicated a central N400 memory-related effect (hit vs. miss). Remarkably, no such effect was observed within the real or the VR condition. However, these conditions elicited comparable differences at frontal electrodes in the same latency when comparing the ERPs to old and new items.

Our study provides evidence that the central N400 effect only occurs under laboratory conditions. It might be a result of shallow, familiarity-related processes and reflect real-life cognition only to a limited extent. Conversely, the higher degree of self-involvement in the real and the VR condition allowed for an autobiographical decision. The similarity between these two conditions makes VR a promising tool for future studies with enhanced ecological validity.
FR 43

The role of dopamine in the exploration/exploitation trade-off

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Decision-making in a dynamic environment often involves choosing between exploiting well-known options (e.g., your favourite ice cream) and exploring novel options (e.g., a new type of ice cream on the market). Dopamine, a neurotransmitter closely associated with reward-seeking behaviour, is thought to play an important role in regulating this trade-off between exploitation and exploration.

To study the role of dopamine in exploration and exploitation, we assessed choices and associated brain activity using fMRI in 31 male participants during a 4-arm bandit task under three drug conditions: (1) increased dopamine levels via L-dopa (150mg), (2) decreased dopamine levels via haloperidol (2mg), and (3) placebo. Subjects repeatedly chose between four options (“bandits”) with fluctuating reward values. Maximizing pay-offs entails a trade-off between exploiting the currently best option and exploring alternative options.

Choice data were analysed using hierarchical Bayesian cognitive modeling in order to quantify explore/exploit behaviour and apply these results to a model-based fMRI-analysis.

Results show that choice behaviour is best accounted for by a model that combines a Bayesian learner (Kalman filter model) with a softmax choice rule including an explicit “exploration bonus” that scales with the estimated uncertainty of a bandit’s outcome. More importantly, exploration bonus was the only model parameter sensitive to the drug manipulations. To assess whether the drug condition affects the subcortical crosstalk in thalamo cortical loops, we conducted an additional study with 41 participants under the same conditions (1) increased dopamine levels via L-dopa (150mg), (2) decreased dopamine levels via haloperidol (2mg), and (3) placebo.

Individual gains in intrinsic functional connectivity turned out to be significantly associated with individual gains in letter identification (r = 0.40, p = 0.014) and word reading skills (r = 0.38, p = 0.018). These findings (published in the journal Science Advances) crucially complements current neural concepts of reading by suggesting that literacy reshapes early visual computation centers upstream from the primary visual cortex.

POSTERSESSION FREITAG
(POSTERNUMMERN 45 – 88)

FR 45

Social conditioning: Involvement of the amygdala independent of stimulus valence

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The current fMRI study investigated behavioral and neural correlates of social conditioning and whether the learned association might be transferred to ambiguous stimuli. For this purpose, participants were presented with a cover story of a job interview in which they learned which member of the panel talks positively (positive CS+) about the applicant and which person talks negatively (negative CS+) about the applicant after the job interview. Moreover, they learned that two other members of the panel were rather neutral (two CS-) and not involved in this discussion. After this learning phase participants saw faces of these persons as well as ambiguous faces (morphed faces) which were not presented in the learning phase. Rating data demonstrate that the conditioning was successful. Imaging data demon-
strate an increased activity in the amygdala to conditioned stimuli (negative as well as positive CS+) compared to unconditioned (CS-) and ambiguous stimuli. This finding suggests that the amygdala is involved in processing emotional relevance independently of stimulus' valence.

FR 46
Cathodal tDCS and familiarity abolish the face perception bias
Katja Weibert, Veronika Maria Müller, Jessica Sänger
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Faces are perceived in a biased way. The left image half dominates the face perception. Since the left image half is processed in the right hemisphere, this bias has been suggested to reflect enhanced right-hemispheric processing during face perception. We asked whether this face perception bias indeed arises from stronger activation of the right compared to the left hemisphere. To address this question, we performed two experiments. First, we tried to decrease the face perception bias by reducing right-hemispheric face processing. To do so, we used cathodal transcranial direct current stimulation (tDCS), which has been reported to inhibit neural processing. Participants’ face perception was measured before and after cathodal tDCS to the right hemisphere. Cathodal tDCS affected face perception: the face perception bias towards the left image half decreased. This decrease was not observed in a control group, which received sham stimulation. Next, we tried to decrease the face perception bias by enhancing left-hemispheric processing during face perception. To do so, we used familiar faces, which have been reported to activate the left hemisphere stronger than unfamiliar faces. Participants’ perception was measured twice: once for familiar and once for unfamiliar faces. We found that familiar faces were processed differently than unfamiliar faces: Familiarity decreased the face perception bias towards the left image half. Combined, our results suggest that the face perception bias seems to reflect enhanced face processing within the right hemisphere. However, this lateralised processing can be reduced by inhibiting the dominant hemisphere or by engaging the non-dominant hemisphere.

FR 47
Electrophysiological correlates of attentional selection within auditory working memory and perception
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Previous research has shown that we can selectively attend to representations held in auditory working memory (WM). However, the neural underpinnings of retroactive auditory spatial attention remain largely unknown. From the visual domain, we know that there is a substantial overlap in electrophysiological measures of selective spatial attention, both in visual perception and WM. Using event-related potentials (ERPs) recorded in young, healthy adults, we contrasted the neural mechanisms related to attending a target within perceptual sound arrays (pre-cue trials) and auditory WM representations (retro-cue trials). Furthermore, both sound array size (two vs. four items) and task demands (localization vs. detection within the sound array) were varied across experimental blocks. First results suggest considerable differences in electrophysiological measures of selective attention in auditory WM and perception: An examination of difference waveforms across contralateral and ipsilateral anterior electrode sites revealed a greater negativity contralateral to the target sound about 200 ms post-stimulus (i.e. N2ac), indicating spatially selective focusing within an auditory perceptual scene. The latter was irrespective of task demands and array size. However, no such ERP component could be observed in retro-cue trials. In addition, central electrode sites revealed a load-dependent, auditory N3 component emerging approximately 350 ms post-stimulus. The component was previously shown to be associated with retroactively searching through visual WM representations (i.e. N3rs). To conclude, the present study extends our understanding of how auditory representations can be flexibly accessed through top-down attentional processes and provides insights into the underlying neural mechanisms.

FR 48
The Verbal Interaction Stress Task: a new paradigm implementing verbal, interactive and social components for investigating the effects of social rejection on psychosocial stress.
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In recent years, digital communication and social media have taken an indispensable role in human society. Social interactions are no longer bound to real-life encounters, but more often happen from behind a screen. In this behavioral study we developed and validated a new, MRI compatible, social stress paradigm in which we mimicked an online communication platform. During the Verbal Interaction Stress Task (VISTA) participants initiate 30 short conversations by selecting one of the four predefined opening sentences. Two computerized interlocutors respond to the opening sentence with mostly negative comments and rejections towards the participant. This approach induces feelings of social rejection and thereby social stress in the participants. The stress response is measured during and after the social stressor in 30 male and female first year students. Validation took place via multiple cortisol assays acquired via saliva samples, heart rate measurements and questionnaires for subjective measures of stress. We hypothesized that the VISTA leads to elevated release of
cortisol, an increase in heart rate as well as increased level of experienced stress and that these effects are larger in women than in men. During the VISTA heart rate was increased and positive mood decreased over time for both genders. Cortisol assays are currently assessed in the laboratory. With a realistic implementation of verbal, interactive and social components, the MRI compatible VISTA will fill an open niche in social stress research.

FR 49
Real-time fMRI neurofeedback training in overweight/obese subjects to enhance the activity of brain regions that control eating behavior
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Overweight is associated with altered responses to food stimuli of prefrontal brain networks that mediate inhibitory control over ingestive behavior. In particular, activation of the dorsolateral prefrontal cortex (dLPFC) plays an important role in the (self-)control of eating and is related to the success of dietary weight-loss interventions. Real-time (rt) fMRI neurofeedback training is an effective means to gain volitional control of brain activity and has been shown to induce beneficial effects in disorders such as alcohol dependence. We investigated the feasibility of rt-fMRI neurofeedback training to improve self-regulation of the dLPFC in nine overweight/obese subjects (BMI, 25.4-37.8 kg/m²; age, 27-60 years; 3 men) who underwent one session comprising three training runs. Eight participants successfully learned to upregulate dLPFC activity across the three runs. In particular, we observed activation of prefrontal regions as well as insula and striatum, i.e., brain regions essential for inhibitory control and, respectively, neurofeedback-associated learning. Moreover, activity in the anterior prefrontal cortex, an area related to impulse control and dietary success, increased across runs. In a follow-up session four weeks later, pictures of high-, but not low-calorie foods were rated less palatable and healthy and chosen less frequently than before training. Five subjects showed a reduction in BMI of at least 3%. Our pilot study demonstrates that one session of rt-fMRI neurofeedback training enables overweight/obese individuals to upregulate dLPFC activity and might favor enhanced self-control during food choices and weight loss. These promising findings call for corroboration and extension in randomized controlled trials.

FR 50
Angst und körperliche Reaktionen bei wiederholtem Abbruch der Provokation ansteigender Atemnot
Christoph Benke, Elisa Krause, Alfons Hamm, Christiane Pane-Farre
Universität Greifswald, Deutschland


FR 51
Cognitive flexibility processes and the relevance of the alpha frequency network—a graph-theoretical analysis
Nicolas Zink, Nicole Wolff, Ann-Kathrin Stock, Christian Beste
KIP University Hospital

Cognitive flexibility is a major requirement for successful goal-directed behavior in real life situations. The neural mechanisms underlying cognitive flexibility are often examined in task switching paradigms. For these processes it is well-known that oscillations in the alpha frequency band are important to consider. However, an unresolved question concerns the network architecture of alpha
oscillations during such mechanisms involved in task switching. This network perspective is important, because executive functions and mechanisms of cognitive flexibility need to be understood in terms of dynamics in a network and oscillations in the alpha (and theta) band have been suggested to coordinate top-down control processes and large-scale communication within and between neural networks. Using graph-theoretical approaches (small-world networks, SWN) we show how task alpha networks differ between cognitive flexibility mechanisms in memory-based and a cue-based task switching. We show that this network perspective considerably differs from insights derived by standard analyses of ERPs and alpha power. Opposed to ERP and alpha power measures, we show that SWN characteristics do not differ in switching trials, but in repetition trials. The network analysis shows how easy information can be integrated during switching and repetition trials and provide a new venue to understand the neural mechanisms underlying cognitive flexibility.

FR 52
Global EEG network features modulated by detrimental effects of cognitive control
Nicolas Zink, Ann-Kathrin Stock, Christian Beste
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Cognitive control is adaptive in the sense that it inhibits automatic processes to optimize goal-directed behavior, but high levels of control may also have detrimental effects in case they suppress beneficial automatisms. Only if task are performed in an automatic fashion, implicit task relevant features can be used to improve performance, whereas high levels of cognitive control have an adverse effect on performance by hindering the use of implicit task-relevant information.

To get more insights about the neurophysiological mechanisms of the adverse effects of cognitive control, we used event-related potentials (ERPs), time-frequency analysis and network analysis. We found the automatic exploitation of implicit predictive features under conditions of low cognitive control demands to have a beneficial effect on performance and an adverse effect on performance in case of high cognitive control demands.

Bottom-up perceptual and attentional selection processes are not modulated by this effect, whereas the P3 amplitudes and the small world features of the EEG networks in the theta band (4–8 Hz) predict the detrimental effects of cognitive control on performance.

In addition, we were able to show that functional small worldness, as a measure of EEG network synchronization and maintenance of oscillatory brain activity, provides a powerful tool for EEG analysis to get insights about global features of brain networks in different experimental conditions and may be related to maintenance and retrieval of tasks sets.

FR 53
Pro-aktives und re-aktives Autofahren im Fahrsimulator: Gibt es Unterschiede in Verhalten und oszillatorischer Hirnaktivität?
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Hintergrund: Jedes menschliche Verhalten kann eine Antwort auf eine Stimulanz von außen (re-aktiv) sein oder aus einem inneren Antrieb heraus (pro-aktiv) erfolgen. Im Falle des Autofahrens können verschiedene Fahrstrategien (pro-aktiv vs. re-aktiv) möglicherweise den Unterschied zwischen guten und schlechten Autofahrern ausmachen und das individuelle Unfallrisiko beeinflussen. In der vorliegenden Studie untersuchten wir Verhaltens- und EEGL-Maße beim pro- vs. re-aktiven Autofahren im Fahrsimulator.


Alpha- und Theta-Power im EEG werden dagegen in beiden Aufgaben mit zunehmender Dauer größer und mit zunehmender Aufgaben-schwierigkeit kleiner – ein Effekt, der sich vor allem in der pro-aktiven Bedingung zeigt.

Diskussion: Die Ergebnisse werden im Zusammenhang mit anderen Befunden zum pro-aktiv vs. re-aktivem (Fahr-)Verhalten und assoziierten EEG-Maßen diskutiert.

FR 54
Visual attention to emotional faces is affected by vocalizations in social anxiety
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Emotional faces are often accompanied by vocalizations, e.g. happy faces come along with sounds of laughing. Such social stimuli are particularly relevant for individuals with social anxiety. However, the influence of emotional vocalizations on visual attention to emotional faces and the role of social anxiety have hardly been investigated so far. Therefore, in the present study, we presented pictures of happy and angry faces in combination with emotionally congruent, incongruent or no vocalizations to high (HAS; n = 20) and low socially anxious participants (LSA; n = 20) while recording eye movements. Preliminary
results show that enhanced visual attention is directed towards emotional congruent (angry face - angry voice/happy face - happy voice) compared to incongruent stimulus combinations by all participants. Moreover, the presentation of angry vocalizations specifically reduces visual attention to all faces in HAS in comparison to LSA. This can be interpreted as an enhanced attentional avoidance of emotional faces in HAS elicited by angry vocalizations. These data suggest that visual attention to emotional faces can be influenced by emotional sounds, and that social anxiety modulates these effects. These results as well as the importance of multi-modality of social stimuli in the etiology and maintenance of social anxiety will be discussed.

FR 55
Effects of pre-extinction stress on extinction of conditioned heart-rate responses in healthy men
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Human fear conditioning studies of the last years predominantly rely on conditioned skin conductance responses (SCRs) and startle as the peripheral measures, while only few studies address conditioned cardiac responses. On the other hand, these responses provide an interesting differentiation of response patterns under threat with accelerators (heart rate [HR] increase) vs. decelerators (HR decrease to the conditioned stimulus [CS+]). By now a) extinction recall of the conditioned cardiac response is seldom addressed, and b) experimental manipulations affecting fear extinction in SCR (e.g., pre-extinction stress) are not examined with HR. Thus, we examined cardiac responses in a differential fear conditioning paradigm with 40 healthy men, covering habituation, acquisition, extinction learning (Day 1) and fear extinction recall (Day 2). Further, we used a cold pressor test (CPT) stressor vs. warm-water-control immediately prior to extinction learning [1]. The CPT triggering a reliable first-wave stress response was expected to improve extinction learning and especially extinction recall. Two geometric figures (5 sec) served as CS+/ CS−, a 2-sec aversive sound (95 db[A]) was the unconditioned stimulus. Previous analyses of SCR-data showed that CPT-stress improved extinction learning (Day 1) and led to better extinction recall (Day 2) [1]. Considering the cardiac fear response, accelerators and decelerators were identified during fear acquisition. Analyses of extinction learning and recall in these responder types after CPT (vs. control), and of correlations between SCRs and cardiac fear responses are in progress and will be presented.


FR 56
Modulation of aggression by prefrontal transcranial direct current stimulation in healthy participants
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Previous research reveals the importance of the dorsolateral prefrontal cortex (DLPFC) for the regulation of emotions. It has been previously shown that decreased activity of the DLPFC is associated with high trait aggression and increased aggressive behavior. Current trends in the literature suggest that transcranial direct current stimulation (tDCS), a non-invasive technique to modulate cortical excitability, increases cognitive control over negative emotions and reduces aggressive behavior when applied over the right DLPFC in healthy individuals.

In a double-blind sham-controlled study, we aim to demonstrate that anodal tDCS can be used to beneficially modulate the neural and behavioral correlates of aggression in healthy men. Participants perform an aggression paradigm during functional magnetic resonance imaging (fMRI) before and immediately after receiving a single session of anodal or sham tDCS for 20 minutes over the right DLPFC. We find differences in fronto-limbic activations following anodal stimulation in the second fMRI session compared to the first. Further, there is a trend toward lower levels of aggression-related behavior in participants who receive active stimulation in contrast to the sham stimulation group.

This study will add further knowledge to the neural correlates of the regulation of aggressive behavior and the putative beneficial effect of anodal tDCS on the modulation of such behavior.

FR 57
Achtsamkeitsbasierte Stressbewältigung reduziert stress-assoziierte Einflüsse auf die Methylierung des Serotonintransporter-Gen
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Einleitung
Achtsamkeitsbasierte Verfahren zur Stressbewältigung sind in klinischen und vonklinischen Settings weit verbreitet, um stressassoziierten Störungen und Erkrankungen vorzubeugen oder die Behandlung ebensolcher zu unterstützen. Inwiefern diese Verfahren auf molekularbiologischer Ebene stressassoziierte Einflüsse auf das Serotonin-System reduzieren können, ist bisher nicht untersucht.
Methode

Ergebnisse
Die Analysen mit Mehrebenen-Modellen ergaben, dass die Trait-Achtsamkeit in der EG signifikant anstieg, während sie in der KG sank (β = 2.31, p < 0.03). Die mittlere Methylierung (Box-Cox-transformiert) sank in der KG signifikant, blieb in der EG jedoch nahezu unverändert (β = 0.0015, p < 0.00) und zeigte positive Assoziationen mit Trait-Achtsamkeit (β = 0.0004054, p = 0.0463).

Diskussion

FR 58
Beeinflussen zyklusabhängige hormonelle Schwankungen bei Frauen die Ansprechbarkeit auf erotische Reize in ereigniskorrellierten Potentialen?
Aisha Munk, Aaron Zöller, Phillip Grant, Jürgen Hennig
Universität Gießen, Deutschland


FR 59
THE ROLE OF FEAR OF PAIN IN THE NPU THREAT PARADIGM
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Background: State and trait anxiety and fear influence pain. Especially fear of pain as a personality trait (interpretation of pain-related stimuli as a threat), increases pain perception.
Aims: We investigated the influence of fear of pain on pain perception in dependence of both, state anxiety and fear.
Methods: We used the NPU Paradigm, which assesses fear and anxiety by administering aversive stimuli in three conditions: predictable (P; shocks only in presence of visual cue), unpredictable (U; shocks possible at any time) and no shock (N; control condition). 40 healthy subjects participated in our study.
Pain perception (intensity and painfulness), anxiety and fear were rated. Startle reflex was measured to identify emotional reactions. Fear of pain questionnaire (FPQ) was assessed and median split was calculated to compare subjects with high and low fear of pain.
Results: Main results revealed that when shocks were unpredictable subjects with high fear of pain rated the intensity of electric stimuli higher than subjects with low fear of pain. In addition, they were more fearful of shocks, showed more anxiety and had enhanced startle magnitudes in most conditions.
Conclusion: Results suggest that fear of pain generally influences responses to painful stimuli (startle magnitude, anxiety, fear, pain perception), regardless of state anxiety and fear. Only perceived intensity of electric shocks was higher when they were unpredictable.
Implications: Further studies should clarify the interplay between fear of pain, anxiety and fear as well as their effects on behavioral and emotional measures in experimental pain testing.
FR 60
The socially evaluated handgrip test: Validation of a novel time-efficient, feasible laboratory stressor
Johannes B. Finke, Grit Kalinowski, Hartmut Schächinger
Universität Trier, Deutschland

Most widely-used stress-induction procedures (such as the TSST and the Cold Pressor Test) require considerable effort and overhead in terms of preparation, logistics, and staff recruitment. Moreover, while known to reliably induce HPA axis activation, especially when combined with social self-threat, most conventional laboratory stressors cannot be flexibly adapted to elicit either a mainly autonomic or an additional endocrine stress response. Being a promising alternative approach, a new version of the isometric handgrip test enriched by a social-evaluative component was validated in the present study.

On two consecutive sessions, forty participants (20 men) performed a handgrip task at both 45% (stress) and 10% (control) of maximum voluntary isometric contraction lasting for 3 min. During the stress test, continuous visual feedback on performance was given. Participants in the social-evaluative condition (50%) were observed and evaluated by a previously unknown person of the opposite sex, whereas in the standard condition feedback was provided via a computer monitor. Cardiovascular measures (heart rate, blood pressure) as well as additional indices of autonomic reactivity (skin conductance, heart-rate variability) were registered before, during, and after stress induction. Moreover, changes in salivary cortisol and in subjective well-being were assessed.

Relative to control, significant increases in cardiovascular and autonomic activity were found, irrespective of experimental group. Importantly, however, additional social evaluation resulted in elevated cortisol levels (also, a trend for higher heart-rate variability) were registered before, during, and after stress induction. Moreover, changes in salivary cortisol and in subjective well-being were assessed.

Relative to control, significant increases in cardiovascular and autonomic activity were found, irrespective of experimental group. Importantly, however, additional social evaluation resulted in elevated cortisol levels (also, a trend for higher heart-rate variability) were registered before, during, and after stress induction. Moreover, changes in salivary cortisol and in subjective well-being were assessed.

To conclude, the socially evaluated handgrip emerged. In conclusion, the socially evaluated handgrip test represents a versatile, time-efficient method to induce stress in small laboratory settings.

FR 61
Effects of multisensory stimuli on inhibitory control in adolescent ADHD: It is the content of information that matters
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Deficits in inhibitory control are well-known in ADHD, but the nature of these deficits is largely enigmatic. Despite results in healthy people suggest that multisensory (i.e. audiovisual) processing impacts inhibitory control, these processes have not been investigated in ADHD even though there are deficits in multisensory processing in ADHD. We examined the influence of concurrent auditory conflicting or redundant sensory information on response inhibition processes triggered by visual stimuli in a group of adolescent ADHD patients (n= 21) and healthy controls (n= 21), combining high-density event-related potential (ERP) recordings with source localization analyses. In comparison to controls, RI processes in ADHD were compromised in conflicting conditions, but showed no differential modulations compared to controls when redundant auditory information was presented. These effects were reflected by modulations at the response selection stage (P3 ERP) in the medial frontal cortex, but not at the attentional selection (P1 and N1 ERPs) or resource allocation level (P2 ERP). Multisensory information modulates RI processes in ADHD but not via attentional selection by via response selection mechanisms. It is not the mere presence of concurrent, auditory information, but the content of information that is important to consider. The content of concurrent information can destabilize goal-shielding processes in medial frontal regions in ADHD, if the automaticity of a response tendency that competes against the desired goal (i.e. inhibitory control), is increased by concurrent information and if the content of concurrent information taps into a predisposition of ADHD to engage in impulsive behavior.

FR 62
Increased amygdala activity reflects enhanced provoked aggression after testosterone administration
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Most people react aggressively when they are provoked. Such aggressive reactions can be enhanced or reduced via biological messengers such as testosterone.

We aimed to investigate the influence of testosterone administration on brain activity during provoked aggressive reactions. Therefore, we conducted a functional MRI study including 103 healthy male participants receiving either a testosterone or placebo gel and genotyped them for the MAOA polymorphism. About 4 hours after the administration, participants performed a modified version of the Tailor Aggression Paradigm. Here, an ostensible opponent either subtracted little or much money from the participant.

The hormone administration resulted in a significant increase of testosterone levels in the testosterone group. Independent of the group, participants reacted with more money reductions towards...
provoking subtractions in the preceding trial. After testosterone administration this reactive aggressive behavior was significantly increased while the MAOA polymorphism did not significantly influence aggressive behavior. On a whole brain level, high compared to low provoking feedback demonstrated increased activity in the amygdala, preganul anterior cingulate cortex, caudate nucleus and bilateral insula. Group differences analyzed in specific regions of interest demonstrated amygdala activity being increased after high provoking feedback only in the testosterone group. There was no influence of the MAOA polymorphism.

The findings support the suggestion that testosterone modulates human aggressive behavior and corresponding amygdala activity. Importantly the group difference observed in the behavior might be the result of a different neural processing during the feedback phase.

FR 63
Dermatomal Organization of SI Leg Representation in Humans: Revising the Somatosensory Homunculus

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Penfield and Rasmussen’s homunculus is the valid map of the neural body representation of nearly each textbook of biology, physiology, and neuroscience. The somatosensory homunculus places the foot representation on the mesial surface of the postcentral gyrus followed by the representations of the lower leg and the thigh in superio-lateral direction. However, this strong homuncular organization contradicts the dermatomic organization of spinal nerves. We used somatosensory evoked magnetic fields and source analysis to study the leg’s neural representation in the primary somatosensory cortex (SI) in 18 healthy subjects. We show that the representation of the back of the thigh is located inferior to the foot’s representation in SI whereas the front of the thigh is located laterally to the foot’s representation. This observation indicates that the localization of the leg in SI rather follows the dermatomic organization of spinal nerves than the typical map of neighboring body parts as depicted in Penfield and Rasmussen’s illustration of the somatosensory homunculus. Therefore, there is a need to revise the Penfield maps with respect to specific aspects of the leg’s representation.

FR 64
Psychobiologische Diagnostik stressassoziierter Symptome

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FR 65
Pay me and I (don’t) care (any)more: Neural and behavioral interplay of intrinsic and extrinsic motivation

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Motivation can be generated intrinsically, by a state of internal desire, or extrinsically, by reward or punishment. Both intrinsic and extrinsic motivation have been shown to facilitate memory and its neural substrates. Behaviorally both kinds of motivation show a similar facilitatory effect and neuronal patterns overlap, yet extrinsic and intrinsic motivation on learning have not been studied in combination. Past research suggests that extrinsic motivation may undermine intrinsic motivation.
We aimed to investigate behavioral and neuronal interplay of intrinsic and extrinsic reward in a trivia learning experiment. 35 healthy participants were investigated. In a screening phase, each participant rated 770 trivia questions on 6-point scales for confidence in knowing the answer and curiosity for the answer. Based on these individual ratings, 270 trivia questions were subsequently selected per subject for a study phase in the fMRI. Questions from all curiosity bins were equally combined with one out of three possible levels of reward. The next morning, participants were asked to type in each answer.

Early results indicate reward and curiosity facilitate memory for trivia questions, without evidence for a detrimental interaction. Preliminary fMRI analyses show an overlap between reward and curiosity-related activity in pre-SMA. Further analyses will determine the amount of overlap and specificity of the observed effects of reward and curiosity in target regions such as the hippocampus and ventral striatum.

Our study provides initial evidence for a preservation of facilitatory effects of curiosity and reward on memory when combined, which has beneficial implications in various educational contexts.

FR 66
The Effects of Inhibitory Transcranial Magnetic Stimulation of BA44 during a Facial Imitation Task
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Imitation of facial expressions is a core function of social cognition. Some propose the mirror neuron system (MNS) to be the basis of imitative behavior, enabling social cognition by simulation of observed actions. However, studies allowing a causal inference of the MNS for social cognition are missing. In this fMRI-study, we investigated the role of BA44 for the imitation of emotional facial expressions by applying inhibitory transcranial magnetic stimulation (TMS).

66 healthy participants participated in two fMRI sessions comprising a facial imitation task. In the experimental conditions, they observed and imitated emotional faces, and in the control conditions they performed emotional and non-emotional facial expressions without a visual facial stimulus. TMS was targeted at the coordinate within right BA44 with highest activation during imitation in the first session. Half of the participants received an inhibitory theta burst stimulation protocol, whereas the other half received sham TMS.

Activation in BA44, superior temporal sulcus, amygdala and fusiform gyrus was higher during imitation compared to observation as well as the control conditions. Between-group analyses revealed stronger activation in the right temporal pole during imitation compared to the non-emotional control task in participants having received real TMS in contrast to sham TMS.

In the present study, facial imitation is associated with activation in the MNS and regions relevant for face and emotion processing, supporting the assumed role of the MNS for social cognition. The enhancement of temporal pole activation after TMS suggests a switching from a simulation approach to a reliance on emotional scripts.
fear and stress responses, as well as the modulation of those responses has been observed. However, until recently it was difficult to measure long-term secretion of testosterone. Sampling of testosterone concentration in the hair now allows to change this. This study aims to clarify the role of long-term testosterone secretion in emotion processing and the corresponding neural circuitry. We assumed an association of higher testosterone levels with reduced direct emotion processing and increased involvement of prefrontal areas during the viewing of emotional pictures. 43 healthy male participants were shown blocks of negative, positive, sexual and neutral pictures from an affective picture database in a picture-perception paradigm during a functional MRI scan. Baseline testosterone levels from the last 2 months were assessed in hair samples and correlated with the BOLD response. There was a significant positive correlation between high testosterone concentration and activation of prefrontal areas (vmPFC, OFC) during processing of negative as well as positive but not sexual emotional pictures. Contrary to hypotheses, there was no negative correlation between high testosterone concentration and activation of direct emotion processing areas like amygdala during processing of any emotional pictures.

FR 69
Neural correlates of ambiguity in speech-nonspeech discrimination
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During the process of learning, we initially rely on weak action-outcome relations and therefore are often uncertain about the outcome of our behavior. Less is known about the neural processes underlying the evaluation of certain and uncertain situations. Prior studies often used “probability” to investigate this issue with the restriction, that the concept of uncertainty and surprise cannot be differentiated in probability-learning tasks. Since high and low ambiguity also causes weak action-outcome relations, we developed an auditory speech-nonspeech discrimination task using stimuli which differ gradually in term of their speech and nonspeech content. As material we used the German vowel /a/ as speech and its spectrally rotated version as nonspeech stimulus. By blending the stimuli into each other in different percentage steps, we received stimuli of low ambiguity (containing a lot more speech or nonspeech), easy to categorize as speech or nonspeech, leading to “certain” responses, or stimuli of high ambiguity (containing similar amount of speech and nonspeech), hard to categorize, leading to “uncertain” responses. Performance feedback was given after each trial, indicating the correctness of the given response. During this task, electroencephalography (EEG) was recorded. Stimulus- and response-locked event-related potentials (ERPs) were analyzed. Regarding stimulus-locked EPRs, we found Ambiguity to effect the P3a (fronto-central) and the P3b (parietal) and Material influenced the N2 and N4. Furthermore, we found Ambiguity to effect the response-locked ERN. Results suggest Ambiguity (uncertainty) as well as Material (speech/nonspeech) to effect the decision and conduction.

FR 70
Neuronale Korrelate subjektiver CS-UCS-Kontingenz bei appetitiver Konditionierung
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FR 71
Shape alterations of basal ganglia in regular cocaine users
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Cocaine abuse is often associated with structural and functional alterations in mesolimbic and related structures. However, voxel-based approaches, which are primarily used in the investigation of structural alterations related to cocaine misuse, do not allow an accurate description of structural disparities, particularly within subcortical structures, due to their low sensitivity. Shape analysis
attempts to circumvent the restrictions inherent to voxel-based methods to allow a more precise identification and localization of subcortical abnormalities. For this preliminary analysis, twenty-four regular cocaine users (CU) and thirty-five healthy controls were subjected to MRI analysis. Anatomical images were analyzed using the Oxford Centre for Functional MRI of the Brain’s FSL FIRST toolbox to elucidate potential shape differences in the basal ganglia. Lifetime cocaine use (in gram) was assessed using the structured and standardized interview for psychotropic drug consumption. Group analysis revealed a significant shape difference between CU and healthy controls. CU displayed hypertrophy in the right medial pallidum. Healthy controls, however, did not show any shape-related hypertrophy. The correlational analysis revealed a close to significant positive relationship between lifetime cocaine use and the right pallidum in CU. The observed differences in the group analysis indicate a potential dissociation of structural composition between drug users and non-users that reflects the effects of cocaine use on structures within the mesolimbic pathway. The findings of this analysis seem to integrate well into the existing literature on the pallidum’s dysfunctional role in reward-related modulation while providing a more sensitive description of subcortical abnormalities in the context of cocaine abuse.

FR 72
Test-Retest-Reproduzierbarkeit eines kombinierten Kaltwasser- und Leistungsstresses

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FR 73
An EEG based map of emotional arousal

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Psychologists and neuroscientists use different psychophysiological measures of arousal to indicate physiological reactions at baselines and in response to various types of arousing stimuli. Psychophysiological arousal (e.g. measured via GSR) and its neurophysiological correlate (e.g. measured via EEG) have been found to be highly correlated, however can a GSR trace in response to emotional content be predicted by EEG based pattern within subjects and can a group mean pattern predict an individuals’ GSR response? This study investigates the prediction of GSR traces within subjects and for groups based on EEG data and its correlation with subjective experiences. Using the DEAP dataset, based on n=32 participants, an EEG based pattern for emotional arousal was computed and cross validated. Predicted and true variables were highly correlated within subjects, however, a group mean pattern showed a much lower relationship with an individuals GSR response. In addition, correlations between subjective ratings of the emotional response to the emotional stimuli and the RMSE of the within-subject prediction were computed: a significant but low correlation shows that the subjective rating of stimuli is related to the uniformity of the relationship between EEG and GSR responses. These findings have implications for the understanding of the relationship between EEG derived emotional arousal reactions and GSR derived measures, as well as for the generalizability from individuals to groups using these measures.

FR 74
Sustained and phasic fear in high- and low- anxious healthy students – an ambulatory assessment study

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While fear is conceptualized as adaptive state of apprehension to threat (phasic fear), anxiety is a sustained state leading to tension and worry (sustained fear). The NPU-threat test is an acoustic startle
paradigm that was shown to distinguish fear- and anxiety-potentiated reactions. A first study, exploring if startle responses to this paradigm are related to fear in real life, revealed no significant association with ambulatory assessment (AA) measurements.

To further explore this association, two groups of high- (N = 15) and low-anxious (N = 15) participants were identified using the anxiety trait scale of the State-Trait-Anxiety-Depression-Inventory (STADI). Subjects were then exposed to the NPU-threat test and performed an AA at 4 days with 7 beeps triggered quasi-randomly between 0900 and 2100 hrs by a smartphone. At alarms the anxiety state scale of the STADI was presented, assessing “Aufgeregtheit” (conceptualized as measure of phasic fear) and “Besorgtheit” (serving as measure for sustained fear) with 5 items each.

Startle reactions did not differ between high- and low-anxious subjects. Mean “Besorgtheit” scores showed intra- as well as interindividual variability whereas “Aufgeregtheit” scores showed a higher intra-individual variability across AA. Multi-level analysis revealed a significant association between group and AA measures. Being high-anxious was associated with higher scores in state agitation. However, we did not observe a significant association between startle responses and AA measurements.

An alternative approach to detect a possible link between startle responses and AA measures could be to take AA measurements while subjects are exposed to significant stress.

FR 75
Elektrophysiologische Korrelate in einer Simon-Aufgabe: Vergleich von cEEGrid- und Kappen-EEG

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FR 76
Developing a feedback system for stress-related changes in breathing

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Under stress, breathing tends to become faster and more irregular. Our intent was to explore biofeedback of un-paced breathing to increase awareness of stress-related changes in respiration. The first step towards this goal consisted of collecting data on respiratory and cardiac changes and quantifying and comparing their utility in predicting stress. To this end we used a within-subjects-design consisting of two baseline conditions (BL) comprising passive viewing of neutral pictures and two „stress“ tasks (ST) involving high mental load (i.e. arithmetic + executive processing) in a BL-ST1-BL-ST2 design. ST2 additionally included a social-evaluative component. The difference between baselines and stress tasks was clearly present in physiological parameters and subjective experience of being „tense“, with large effect sizes for subjective experience and breathing parameters and small to intermediate effect sizes for cardiac parameters including heart rate variability. Median breath duration was the best predictor of condition (~ 75% correct prediction of condition), potentially improved only by adding a parameter of irregularity of breathing. Despite a very large difference in subjective experience between ST1 and ST2 (i.e. the effect of social evaluative threat), such a difference was almost absent in physiological parameters except median breath duration. A critical amount of respiration segments had to be excluded from analysis due to inability to algorithmically detect respiration peaks, especially in stress conditions. This constitutes a major challenge for future studies next to the development of online parameters that can be determined on a sufficiently short timescale to be feasible for feedback.

FR 77
The interaction of subliminal and consciously induced cognitive conflicts reflects a local process.

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Controlled behavior can be influenced by subliminal or consciously processed information conflicts. Yet, there is evidence that these two types of conflict interact in their modulation of controlled behavior. However the underlying neural mechanisms have remained largely unclear. In this study, we investigate whether there are differences in neurophysiological mechanisms and networks underlying such modulations using event-related potentials (ERPs), time-frequency analyses as well as small world analyses. A group of n= 40 young and healthy participants perform a paradigm, which combines a target stimulus with a subliminal prime as well as with consciously perceived flankers. The results show the interaction of subliminal and consciously processed conflicts occurring at earliest stage of perceptual and attentional processing (P1) and response selected stage (N2).
Also, results show that the interaction of these two conflicts is associated with stronger theta band activity at the electrode Cz. However, “small world” properties, which are thought to reflect efficient network organization, do not show the interaction of these two types of conflict. These results suggest that the interaction of subliminal and consciously triggered conflicts reflect a local process either than an efficient network organization.

FR 78
Do Shifting and Inhibition rely on the same or different neural processes? An EEG-study of a Shifting task with flanker stimuli

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Various cognitive abilities such as working memory or intelligence are said to rely on executive functions. Mostly three different executive functions are separated, namely shifting, updating, and inhibition. Correlational analyses typically show that these three executive functions are related. In how far these executive functions require the same cognitive processes and whether they are independent or inter-related on a neural level is not yet understood.

In the present experiment, we explored the connection between the executive functions shifting and inhibition on behavioral and neural level. For this, participants completed a Shifting task with additional flanker stimuli while an EEG was recorded. Flanker stimuli were congruent, incongruent or neutral corresponding to the target stimulus. This experimental manipulation provided the possibility to assess whether the two executive functions shifting and inhibition are functionally independent or connected to each other.

Incongruent flanker stimuli deteriorated both accuracy and reaction time of responses to the target stimulus. Moreover, participants reacted more slowly and more incorrectly in switch-trials than in repeat-trials. However, these two effects were independent of each other. Further analysis of latencies and amplitudes of ERP-components, especially the P3, shall reveal in how far task shifting and inhibition rely on different or equal neural processes.

FR 79
Testing emotional capacity - a pilot study

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Emotional facial expressions serve two functions: they provide information about the emotional state of others and they signal salience by giving one emotional expression (e.g. anger, fearfulness) processing priority over others (e.g. neutral expressions). As a consequence, the information function of emotion may profit from multiple parallel representations, whereas the salience function may take advantage of a competitive winner-take-all principle. Thus, the salience function predicts superior memory performance for some emotions (e.g. angry vs. neutral) at higher set sizes, whereas the information function predicts no emotion-by-set size interaction.

In order to contrast these two functions, we investigated the short-term memory capacity for emotional expressions (angry, fearful, sad, happy, neutral) using eye tracking in a variant of a delayed match-to-sample procedure with set sizes 1, 2, and 4. Our results indicated that individuals can hold more than one emotional expression in short-term memory (mean Cowan’s K = 2.74). Contrary to the predictions derived from the salience model, however, we found that neutral and happy faces were better remembered than angry, sad, or fearful faces at all set sizes, indicating that this emotion effect was driven by item difficulty rather than emotional content. Somewhat similarly, gaze durations were longest for „difficult" sad and fearful expressions and shortest for the „easy” happy expression.

Together our results suggest that multiple emotional expressions can be represented in parallel, whereas – under explicit memory conditions – there is no modulating effect of emotional expression beyond item difficulty.

FR 80
Perceptual salience differentially modulates cognitive stability vs. flexibility.

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The pursuit of behavioural goals in an ever-changing environment requires balance between flexible adaptation (cognitive flexibility) and stable maintenance (cognitive stability) of behaviour. This balance has been attributed to dopaminergic neurotransmission. Another important function of dopamine involves the signalling of the salience of environmental stimuli. However, little is known about potential interactions between these functions. Here, we varied salience orthogonally to task-switching (cognitive flexibility) and distractor inhibition (cognitive stability) while electrophysiological brain signals were recorded (n = 19). Perceptual salience of target stimuli was modulated such that half of the sample had to flexibly change behaviour to the brighter of two simultaneously emerging digits while inhibiting the darker one (high salience group), while the other half reacted to the darker digit while inhibiting the brighter one (low salience group).

ERPs show robust N170 increases for both flexibility and stability as compared to the baseline task (in which only one stimulus was presented), as well as a late parietal positivity (~600ms post-target) in the task-switching condition. Behavioural analyses revealed an interaction between target salience and task condition, with significantly higher stay costs (i.e. reaction time penalties in the face of distraction) when suppressing a perceptually more salient (brighter) distractor. A salience-dependent modulation of switch costs did not emerge. These results suggest differential effects of perceptual salience on cognitive stability vs. flexibility. Salience modulation of flexibility- and stability-related ERPs will be presented to investigate...
in more detail how perceptual salience modulates cognitive stability vs. flexibility.

FR 81
Blunted brain reactions to natural rewards in healthy and obese binge women presented with personally irresistible food cues.

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We investigated the motivational salience that obese binge eaters and healthy controls assign to food cues by recording the Late Positive Potential/LPP while we displayed images of personally irresistible foods. Food cues were presented interspersed with affective images (erotica, attacks, and neutral objects) that served as control cues. Consistent with several studies, obese and controls did not differ in their reactions to food and emotional cues, showing the expected emotional modulation of the LPP. However, we also investigated whether brain reactions of obese bingers and controls supported the existence of a common phenotype, that, in line with recent proposals, should emerge as a function of reactions to food and natural rewards rather than Body Mass index/BMI. Thus, we ran cluster analysis on LPP data, with the goal of identifying subgroups of individuals based on the amplitude of their LPP to food cues. Results showed that some individuals, regardless their BMI, assigned moderate motivational salience to food and simultaneously showed increased reactions to natural rewards (erotica), whereas others reacted excessively to food cues but meagerly to natural rewards. The data emerged replicate and extend the existing studies, that focused on an indistinct obese sample, giving evidence of the existence of such endophenotype also in obese women who suffer from binge eating disorder.

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FR 82
Visual Cortical Networks Involved in Scene Perception Alignment with Visual Cognition in Early Childhood

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This study investigates how visual cortical networks align with inter-individual differences in visual cognition, namely the sensitivity for the object versus the background of a visual scene, in early childhood. To segregate object and background processing in the visual cortex in 5- and 7-year-old children, object and background were presented at different frequencies (12Hz or 15Hz), evoking disparate neuronal responses (steady state visually evoked potentials, SSVEPs) in the electroencephalogram (EEG). Furthermore, visual cognition was assessed in verbal picture descriptions and recognition memory tasks. In younger children compared to older children the background elicited higher SSVEPs. Visual cortical processing of object versus background were associated with visual cognition for older but not for younger children. This relation was strongest for verbal descriptions and generalized to the cortical processing of abstract stimuli and object and background presented alone. Thus, visual cortical networks restructure and align with acquired visual cognition in early childhood.

FR 83
Early Responses to Emotional Facial Expressions: An EEG-fMRI study

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The purpose of the present EEG-fMRI study was to investigate neuronal correlates of early stages of affective face processing. To this means, we simultaneously measured event-related potentials (ERPs) and BOLD signal changes in response to the presentation of neutral, positive and negative facial expressions of either low or high intensity (no intensity levels for neutral expressions). Participants engaged in a focal bars task, while facial expressions were presented at image center for 150 ms. Potential modulations by facial expressions were modelled using contrast weights derived from stimulus ratings from an independent sample. EEG analysis confirmed a significant quadratic trend reflecting modulations by stimulus arousal, which fell within the latency of P1 amplitudes. With regard to BOLD activation, modulations by facial expressions were most prominent in the right FFA and right STS and again reflected quadratic effects by stimulus arousal. On a single trial basis, our combined EEG-fMRI analysis revealed significant correlations between P1 amplitudes and BOLD activation in the inferior occipital cortex and the left amygdala. In sum, our preliminary results indicate that responding to emotionally significant facial stimuli begins early, reflects modulations by stimulus arousal rather than valence, and might rely on responses within the inferior occipital cortex and the left amygdala.

FR 84
Visuelle Aufmerksamkeitslenkung unter Stress: Effekte auf lateralierte alpha-Band Oscillationen

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Es wird vermutet, dass Stress einen Einfluss auf Aufmerksamkeitsprozesse hat, allerdings ist die Befundlage bisher widersprüchlich. Die meisten diesbezüglichen Studien beschränken sich auf Verhaltensdaten. Hier haben wir eine Variante des weit verbreiteten Posner Paradigmas angewendet, um den Effekt von Stress auf die endogene visuell-räumliche Aufmerksamkeitslenkung vor Zielreizpräsentation zu untersuchen, indem die Modulation der oszilatorischen alpha-Band Aktivität im Cue-Target Interval erfasst wurde. 24 männliche Probanden durchliefen den bilateralen Fußkaltwassertest (CPT) und eine Kontrollprozedur mit warmem Wasser an zwei Tagen im Abstand

FR 85

Demands on inhibitory control processes determine modulations of theta band activity by the norepinephrine system in superior frontal areas

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Response inhibition processes are important for goal-directed behavior and particularly demanded when it is unlikely to inhibit automatically executed responses. The norepinephrine (NE) system is an important factor for inhibitory control. Here we ask whether there are specific functional neuroanatomical structures in humans in which these regulatory effects by phase NE system activity are evident. Moreover, on the basis of theoretical considerations, we propose that modulatory effects of the NE system on inhibitory control processes strongly depend on the likelihood and hence the difficulty to exert inhibitory control. We show that the NE system modulates inhibitory control processes via theta band activity in the superior frontal gyrus. Importantly, this is only the case when the likelihood to inhibit a prepotent response tendency is low. When the likelihood to exert inhibitory control is higher and response inhibition is easier, no modulations are observed. This is probably because the processing mode used for inhibitory control may not fit to computational principles of the NE system. The modulations observed may reflect the encoding of a surprise or a conflict signal. It seems that the NE system gains and loses relevance to modulate inhibitory control depending on conditions that determine demands on inhibitory control.

FR 86

Differentielle funktionelle Einbindung verschiedener Amygdala-Regionen

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FR 87

Behavioral and neuronal determinants of negative reciprocity in the ultimatum game

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The rejection of unfair offers in the ultimatum game (UG) indicates negative reciprocity. The model of strong reciprocity claims that negative reciprocity reflects prosociality since the rejecting individual is sacrificing resources in order to punish unfair behavior. However, a recent study found that the rejection rate of unfair offers is linked to
assertiveness (status defense model). To pursue the question what drives negative reciprocity, the present study investigated individual differences in the rejection of unfair offers along with their behavioral and neuronal determinants. We measured fairness preferences and event-related potentials (ERP) in 200 healthy participants playing a computerized version of the UG with pictures of unfair and fair proposers. Structural equation modeling (SEM) on the behavioral data corroborated both the strong reciprocity and the status defense models of human cooperation: More prosocial but also more assertive individuals were more likely to show negative reciprocity by rejecting unfair offers. Experimental ERP results confirmed the feedback negativity (FN) as a neural signature of fairness processing. Multilevel SEM of brain-behavior relationships revealed that negative reciprocity was significantly associated with individual differences in FN amplitudes in response to proposers. Our results confirm stable individual differences in fairness processing at the behavioral and neuronal level.

FR 88
Modulations of cognitive flexibility in obsessive compulsive disorder reflect dysfunctions of perceptual categorization
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Despite cognitive inflexibility is trait-like in OCD patients and underlies clinical symptomatology it is elusive at what stage of information processing deficits leading to cognitive inflexibility emerges. We hypothesize that inhibitory control mechanisms during early stimulus categorization and integration into a knowledge system underlie these deficits. We examined N=25 adolescent OCD patients and matched healthy controls (HC) in a paradigm manipulating the importance of the knowledge system to perform task switching. This was done using a paradigm in which task switches were either signaled by visual stimuli, or by working memory processes. This was combined with event-related potential (ERP) recordings and source localization. OCD patients showed increased switch costs in the memory- as compared to the cue- based block, while HC showed similar switch costs in both blocks. At the neurophysiological level, these changes in OCD were not reflected by the N2 and P3 reflecting response-associated processes, but by the P1 reflecting inhibitory control during sensory categorization processes. Activation differences in the right inferior frontal gyrus and superior temporal gyrus are associated with the P1-effect. Cognitive flexibility in adolescent OCD patients is strongly modulated by working memory load. Contrary to common sense, not response-associated processes, but inhibitory control mechanisms during early stimulus categorization processes associated with right inferior frontal and superior temporal gyrus mechanisms are likely to underlie cognitive inflexibility in OCD.
Decoding retrieval success and memory content during short-term memory maintenance

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In his search for the physical substrate of long-term memory in the brain, Semon proposed that, apart from coding the particular content of a learning episode, an engram should enable correct memory retrieval. Using multivariate pattern classification, we tested whether electrical brain activity recorded during short-term memory maintenance satisfies these conditions, and where identified short-term memory representations reside. In our experiment, participants learned two short-term memory tasks, encoding either pictures of faces or houses, or sequences of digits or letters. Brain activity was recorded using EEG. It was possible to decode retrieval success from electrical brain activity during the delay period of both short-term memory tasks. Moreover, we could distinguish whether participants kept pictures of faces or houses in memory, and classifier performance on this problem correlated with successful memory maintenance. Using spatial as well as frequency band-based searchlight analyses, we found that distinct brain areas and frequency bands coded for the success versus the content of short-term memory. Frontal and parietal higher frequency bands and alpha activity predicted retrieval success, whereas memory content was represented in temporal and parietal higher frequency ranges, as well as theta activity. We propose that frontal cortex supports memory-related control processes, whereas temporal cortex shows a sensory reinstatement of material content and is part of the wider activated network during memory retention. Interestingly, the only overlap between electrodes coding for retrieval success and memory content was found over medial parietal regions, indicating that a dedicated short-term memory representation resides in medial posterior cortex.

Imaging memory transformation: neural signature of detailed and gist-like memories of recent and remote events

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Over time, memories undergo a neural reorganization. Yet the exact nature of this reorganization is still debated. According to the Standard Consolidation Theory, memories are gradually consolidated from the hippocampus to the neocortex until they are ultimately independent of the hippocampus. The Memory Transformation Hypothesis, however, postulates that memories undergo a transformation from detailed, episodic to gist-like, semantic representations that can be retrieved solely from the neocortex, whereas the detailed episodic memories would always remain hippocampus-dependent. This experiment contrasted these views and tested the transformation of episodic memories as well as the neural changes associated with the temporal dynamics of memory. Participants encoded pictures and performed a recognition test in the MRI scanner either 1 day or 28 days later. Critically, the recognition test contained, in addition to the original and entirely novel pictures, similar pictures carrying the gist of the original ones, thus allowing us to assess the specificity of memory. Overall, memory performance after 28d was reduced compared to 1d but was still mainly intact. Twenty-eight day old memories, however, were characterized by a striking lack of specificity reflected in a significantly elevated false alarm rate specifically for similar pictures, thus suggesting a transformation to more gist-like memories. Imaging data showed significantly reduced hippocampus and entorhinal cortex activity after 28d (vs. 1d), whereas activity in most neocortical regions of interest did not differ. Multivariate imaging analyses targeting the hippocampal and neocortical representation

Memoria ex Machina: Real memory from virtual reality – An EEG study

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“All-life” autobiographical memory is characterized by self-involvement and rich associative mnemonic networks. Concerns have been raised that conventional “laboratory memory” differs from these vivid experiences. We addressed these concerns by comparing retrieval-related EEG-indices of both forms of memory. Furthermore, we aimed at bridging the gap between both types of remembrance by adding a virtual reality (VR) encoding condition. Participants took either part in a (a) real car drive, were confronted with a (b) 360° VR, or (c) a 2D video of the same ride. An unannounced recognition memory task followed 48 hours after encoding. ERPs revealed that the retrieval of real-life and VR experiences is processed similarly, whereas both differ from the retrieval of conventional laboratory events. Within the 2D condition, we replicated a central N400 memory-related effect (hit vs. miss). Remarkably, no such effect was observed within the real or the VR condition. However, these conditions elicited comparable differences at frontal electrodes in the same latency when comparing the ERPs to old and new items. Our study provides evidence that the central N400 effect only occurs under laboratory conditions. It might be a result of shallow, familiarity-related processes and reflect real-life cognition only to a limited extent. Conversely, the higher degree of self-involvement in the real and the VR condition allowed for an autobiographical decision. The similarity between these two conditions makes VR a promising tool for future studies with enhanced ecological validity.
Neuromodulation as a tool to induce olfactory and auditory source-monitoring deficits in healthy subjects

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Source-monitoring describes the process of determining the source of a percept as external (e.g. a sound, or smell), or internal (an imagined self-generated sound, or smell). Source-monitoring is affected by the similarity of perceived and imagined memories, with (pre-) supplementary motor area (SMA) having a crucial role in distinguishing between the two sources. In this study, we aim to inhibit the functionality of (pre-) SMA using cathodal (and sham) transcranial direct current stimulation (tDCS) in a group of healthy participants. By tDCS-induced transient neuromodulation we hope to introduce source-monitoring deficits in a source-monitoring task involving auditory (i.e. spoken words) and olfactory (i.e. smells) stimuli that are presented to the participant. We expect to find decreased SMA BOLD activation after cathodal tDCS application as well as behavioral indicators of source-monitoring deficits (i.e. ascribing the wrong source to a stimulus). A better understanding of the role of (pre-) SMA in the source-monitoring framework may enable to explain (and treat) hallucinations experienced by clinical populations, in which source-monitoring is known to be heavily compromised (i.e. paranoid schizophrenia). Preliminary results suggest successful down-modulation of (pre-) SMA, as indicated by reduced levels of BOLD activation in participants that received 2mA of cathodal tDCS for 20min compared to a sham control group. These findings are supported by behavioral results that show a trend towards decreased source-monitoring performance of the tDCS group across both modalities. This suggests (pre-) SMA to be a promising candidate region within a source-monitoring network, that if impaired, leads to general source-monitoring deficits.

The time course of cognitive control: New insights under relaxed linearity assumptions.

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Objective: The relationship between predictor variables and brain activity is often assumed to be linear. However, there exist many situations for which this assumption does not hold. To demonstrate this, we focussed on recent findings (Braver, Gray & Burgess, 2007) suggesting that cognitive control operates in two distinct modes. The first, proactive control, is resource costly and preparatory. The second, reactive control, is flexible and allows corrective behavioural adaption. We believe that these processes achieve balance in accordance to task demands and are optimised over time. Further, we believe that these processes are best represented by the magnitude of fronto-central (e.g. CNV) and fronto-parietal (e.g. P3) brain potentials (i.e. ERPs). Method: EEG from 60 participants was recorded during a Continuous Performance Task. Here, participants needed to establish stable proactive control based on the predictive value of cues. Conversely, reactive control was necessary when these predictions were violated. Further, we combine spline regression and multilevel modelling (MLM) to illustrate the relationship between ERPs and the predictors (e.g. predictability, expectancy violation, and time on task).

Results: Activation patterns for the preparatory and reactive control modes differed significantly, as well as their (curvilinear) modulations through time. Discussion: Results indicate that non-linear MLM offers new insights into the modelling of EEG-data. We discuss its advantages in terms of incremental validity, goodness of fit and statistical power.

I want to sleep better: Effects of voluntary control on objective sleep parameters

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Sleep is mainly regulated by homeostatic and circadian factors, and sleep disturbances are typically treated by pharmacological interventions. However, a large portion of non-organic sleep disturbances are caused by psychological factors including worrying, perceived prospective threats and negative recurrent thoughts, suggesting that sleep is strongly influenced by cognitive and affective mechanisms. In support of this notion, we have recently shown the duration of objectively measured slow-wave sleep (SWS) can be extended by using hypnotic suggestions to sleep deeper. Here we aim at testing whether healthy participants are capable of voluntarily influencing objective sleep parameters even without hypnosis. We predict that participants can voluntarily worsen but not improve their sleep as compared to a normal sleep condition. 18 healthy young volunteers participated in one adaptation night and three experimental nights. All nights were done on the same weekday with an interval of one week. Polysomnography and subjective sleep quality was measured during all four nights. In the three experimental nights, participants either had to sleep “normal”, worse than normal or better than normal, in a balanced order. The results show that the subjective and objective sleep onset latency as well as the time spent awake after sleep onset could be significantly altered. In a same direction changed the parameters slow wave sleep and total sleep time, which showed a significant increase. The results demonstrate that it is possible to
influence sleep voluntarily. Findings show a first answer to the question if sleep is influenceable within one’s mean.

Behavioral and neuronal determinants of negative reciprocity in the ultimatum game
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The rejection of unfair offers in the ultimatum game (UG) indicates negative reciprocity. The model of strong reciprocity claims that negative reciprocity reflects prosociality since the rejecting individual is sacrificing resources in order to punish unfair behavior. However, a recent study found that the rejection rate of unfair offers is linked to assertiveness (status defense model). To pursue the question what drives negative reciprocity, the present study investigated individual differences in the rejection of unfair offers along with their behavioral and neuronal determinants. We measured fairness preferences and event-related potentials (ERP) in 200 healthy participants playing a computerized version of the UG with pictures of unfair and fair proposers. Structural equation modeling (SEM) on the behavioral data corroborated the strong reciprocity and the status defense models of human cooperation: More prosocial but also more assertive individuals were more likely to show negative reciprocity by rejecting unfair offers. Experimental ERP results confirmed the feedback negativity (FN) as a neural signature of fairness processing. Multilevel SEM of brainbehavior relationships revealed that negative reciprocity was significantly associated with individual differences in FN amplitudes in response to proposers. Our results confirm stable individual differences in fairness processing at the behavioral and neuronal level.

The Verbal Interaction Stress Task: a new paradigm implementing verbal, interactive and social components for investigating the effects of social rejection on psychosocial stress.
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In recent years, digital communication and social media have taken an indispensable role in human society. Social interactions are no longer bound to real-life encounters, but more often happen from behind a screen. In this behavioral study we developed and validated a new, MRI compatible, social stress paradigm in which we mimicked an online communication platform. During the Verbal Interaction Stress Task (VISTAI) participants initiate 30 short conversations by selecting one of the four predefined opening sentences. Two computerized interlocutors respond to the opening sentence with mostly negative comments and rejections towards the participant. This approach induces feelings of social rejection and thereby social stress in the participants. The stress response is measured during and after the social stressor in 30 male and female first year students. Validation took place via multiple cortisol assays acquired via saliva samples, heart rate measurements and questionnaires for subjective measures of stress. We hypothesized that the VISTA leads to elevated release of cortisol, an increase in heart rate as well as increased level of experienced stress and that these effects are larger in women than in men. During the VISTA heart rate was increased and positive mood decreased over time for both genders. Cortisol assays are currently assessed in the laboratory. With a realistic implementation of verbal, interactive and social components, the MRI compatible VISTA will fill an open niche in social stress research.

NRSN1 associated grey matter volume of the visual word form area reveals dyslexia before school
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Learning how to read and spell requires the brain to reorganize in response to environmental influences. At the same time, literacy skills are heritable and thus to some degree genetically predetermined. Here we related 19 literacy-associated genes to gray and white matter volumes derived by voxel-based morphometry in a cohort of 141 children ranging from 3 to 12 years of age. Subsequently, a sample of 34 children attending grades 4 to 8, and another sample of 20 children, longitudinally followed from kindergarten to first grade, was separated into dyslexics and controls using linear binary support vector machines. Age, gender, handedness, non-verbal IQ and parental education were included as covariates of no interest in the models. The gray matter volume of the “visual word form area” (VWFA) was found to be related to NRSN1, a gene assumed to regulate neurite growth. Moreover, the NRSN1-associated cluster in the VWFA distinguished dyslexics and controls not only after several years of schooling (classification accuracy: 73.53%, p = 0.031, family-wise error-corrected), but also already at a kindergarten age before literacy instruction had actually begun (classification accuracy: 75%, p = 0.035, family-wise error-corrected). These findings (published in the journal Brain) shed new light on the “nature and nurture” of literacy acquisition. We have shown that there seems to be a genetic limit to the neuroplastic adaptivity of the VWFA. These results could pave the way for identifying and treating dyslexia (the most common learning disorder) before it manifests itself in school.
Dermatomal Organization of SI Leg Representation in Humans: Revising the Somatosensory Homunculus

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Penfield and Rasmussen’s homunculus is the valid map of the neural body representation of nearly each textbook of biology, physiology, and neuroscience. The somatosensory homunculus places the foot representation on the mesial surface of the postcentral gyrus followed by the representations of the lower leg and the thigh in superio-lateral direction. However, this strong homuncular organization contradicts the dermatomal organization of spinal nerves. We used somatosensory evoked magnetic fields and source analysis to study the leg’s neural representation in the primary somatosensory cortex (SI) in 18 healthy subjects. We show that the representation of the back of the thigh is located inferior to the foot’s representation in SI whereas the front of the thigh is located laterally to the foot’s representation. This observation indicates that the localization of the leg in SI rather follows the dermatomal organization of spinal nerves than the typical map of neighboring body parts as depicted in Penfield and Rasmussen’s illustration of the somatosensory homunculus. Therefore, there is a need to revise the Penfield maps with respect to specific aspects of the leg’s representation.
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