



Psychologie und Gehirn 2018  
Justus-Liebig-Universität Gießen

31. Mai - 02. Juni 2018

Abstracts & Notizen



- TAGESÜBERSICHTEN -

## Donnerstag, 31.05.2018 - Vormittag -

09:00-09:30	Begrüßung [Hörsaal A1]		
09:30-11:00, Symposien	How do we process social information? Data from inside and outside of the laboratory [A1]	Intelligence and the brain: tracking, predicting, and (an attempt to) enhancing IQ [A2]	Voluntary forgetting: basic mechanisms and impact on emotional health [A3]
Hörsaal	The noradrenergic system in ageing and neurodegenerative disease [A4]	Emotion and Self Processing in the Brain across the Sleep-Wake Cycle [A5]	
Chair(s):	<i>Alexander Lischke &amp; Matthias Gamer</i>	<i>Ulrike Basten &amp; Gerd Waldhauser</i>	<i>Martin J. Dahl &amp; Matthew Betts</i>
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11:30-12:30	DGPA Mitgliederversammlung [Raum E 006]		
12:30-13:30	Mittagspause		
	Roundtable für NachwuchswissenschaftlerInnen mit Meet the Experts (Fachgruppe Biologische Psychologie und Neuropsychologie)[Raum E 006]		

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	Tor Wager: Neuroimaging of pain and emotion: Computation, representation, and regulation, S. 28			
14:30-14:45	Kaffeepause			
14:45-16:15	Neurobiologische Grundlagen von kontextabhängigen Lern und Gedächtnisprozessen	Emotionsregulation: Psychobiologische Korrelate und interindividuelle Unterschiede	Posterblitz	Virtual Reality in der Biologischen Psychologie: Grundlagen und klinische Anwendung
Hörsaal	[A1]	[A2]	[A3]	[A5]
Chair(s):	<i>Christian Merz</i>	<i>Valerie Kinner &amp; Andrea Hermann</i>	<i>Daniela Mier, &amp; Stefanie Lis</i>	<i>Sina Radke</i>
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	Informeller Austausch der Lehrenden im Fach Biologische Psychologie (Fachgruppe Biologische Psychologie und Neuropsychologie)				

## Freitag, 01.06.2018 - Nachmittag -

13:00-14:30, Symposien	Brain and cognition in the real world: Recent advances in mobile EEG	Neues aus der Stressforschung: Aktuelle Befunde zum Einfluss von Stress auf emotionale und kognitive Prozesse	Examining social influences on brain and behavior across development and aging	Take good care and keep track: Die alltägliche Erforschungsgesundheitsrelevanter Verhaltensfaktoren	Neuro-cognitive computational models of reading and visual word recognition
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# 1 **Donnerstag, 31.05.2018**

## 1.1 **Symposienblock I: 09:30-11:00 Uhr**

### 1.1.1 **How do we process social information? Data from inside and outside of the laboratory [Hörsaal: A1]**

Alexander Lischke, Universität Greifswald,  
Matthias Gamer, Universität Würzburg

As social beings, we rarely spent our time in isolation. By contrast, we are frequently surrounded by other individuals, making it almost impossible to avoid social interactions. The course of these interactions crucially depends on the type and amount of information that we are able to process in such situations. Previous research showed that we rapidly and automatically process information about our interaction partners on basis of their faces, but also take contextual information into account to infer intentions, thoughts and feelings of our conspecifics. To this end, we have to integrate various types of information, including stable ones, like, for example, others' facial appearance, but also dynamic ones, like, for example, others' gaze behavior. This symposium aims to elucidate the neurobehavioral mechanisms underlying these processes. Across a series of electrophysiological studies, Mathias Weymar will demonstrate that our memory is modulated by the facial appearance of our interaction partners. Thereafter, Alexander Lischke will use a postural study to reveal that the gaze and emotional expression of others modulate our defensive behavior. Anne Böckler will then present several behavioral studies to elucidate how gaze, motion and emotional expression of our conspecifics interact to determine attentional capture. Finally, Matthias Gamer will present studies within and outside the laboratory to demonstrate how our attention for our conspecifics is modulated by social and physical aspects of the interaction context. Taken together, our symposium will help to better understand the unique nature of social information processing across various contexts.

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NOTIZEN:

**Enhanced short- and long-term memory for untrustworthy faces:  
Behavioral and electrophysiological correlates**

Weymar, Mathias<sup>1</sup>; Ventura-Bort, Carlos<sup>1</sup>; Wendt, Julia<sup>2</sup>; Junge, Martin<sup>3</sup>;  
Hamm, Alfons<sup>2</sup>; Lischke, Alexander<sup>2</sup>

<sup>1</sup>Universität Potsdam, Deutschland; <sup>2</sup>Universität Greifswald, Deutschland;  
<sup>3</sup>Universitätsmedizin Greifswald

In daily life, we automatically form impressions of other people. In two separate event-related potential (ERP) studies, we investigated whether the perceived trustworthiness of faces affects later recognition memory. Participants incidentally viewed 60 neutral faces, rated high and low in trustworthiness. In one study, recognition memory was tested immediately after encoding, in another study we tested delayed recognition memory after one week. For immediate recognition, we found that untrustworthy faces were better recognized than trustworthy faces, and that untrustworthy faces prompted enhanced frontal ERP old/new differences (larger positivity for correctly remembered old faces compared to novel ones). Interestingly, for delayed testing, although overall memory accuracy decreased over time, recognition was still better for untrustworthy than trustworthy faces. Again, a similar frontal old/new difference was found for faces previously rated low in trustworthiness. Taken together, both behavioral and electrophysiological measures indicate enhanced long-lasting, probably familiarity-based, memory for untrustworthy faces. Our memory findings suggest that trustworthiness is a highly relevant construct that may not only affect current but also future social behavior.

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NOTIZEN:

**Freezing in response to social threat in humans: Modulation of defensive behavior by gaze and expression of emotional faces**

Lischke, Alexander<sup>1</sup>; Junge, Martin<sup>1</sup>; Weippert, Matthias<sup>2</sup>; Hamm, Alfons<sup>1</sup>; Mau-Moeller, Anett<sup>2</sup>

<sup>1</sup>Universität Greifswald, Deutschland; <sup>2</sup>Universität Rostock, Deutschland

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 in response to threat, suggesting that freezing is an evolutionary conserved defensive behavior across species. In the present study, we investigated whether social threat also elicits freezing responses in humans. Using posturography, we investigated changes in body sway in response to angry and happy faces with direct or indirect gaze in 40 healthy participants. We found a robust and significant reduction in body sway in response to angry faces with direct gaze as compared to angry faces with averted gaze or happy faces with direct and indirect gaze. Our findings indicate that defensive behavior in humans is modulated by the perceived imminence of social threat. Moreover, our findings suggest that posturography may be a novel tool for investigating freezing responses to social threat in humans.

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NOTIZEN:

**Catching eyes: when and how does direct gaze capture attention?**Böckler, Anne<sup>1</sup>; van der Wel, Robrecht<sup>2</sup>; Welsh, Tim<sup>3</sup><sup>1</sup>Universität Würzburg, Deutschland; <sup>2</sup>Rutgers University, USA; <sup>3</sup>University of Toronto, Kanada

Direct gaze is a powerful social cue that captures attention and enhances subsequent information processing. In our everyday lives, social and non-social cues often co-occur, and the question arises how direct gaze is integrated with other, not necessarily social cues. Combining (social) gaze cues with (non-social) sudden-onset motion cues, we asked participants to classify targets that could appear on faces that suddenly looked towards participants (direct gaze and motion present), suddenly looked away from participants (direct gaze absent, motion present), constantly looked at participants (direct gaze present, motion absent) or constantly looked away from participants (direct gaze and motion absent). Results suggest that direct gaze cues and sudden-onset motion cues had additive effects on attention capture, leading to a processing advantage for targets appearing on faces with sudden-onset direct gaze. Subsequent studies disentangled the role of eye orientation and head orientation in the sudden direct gaze effect and revealed that eye visibility is neither necessary nor sufficient for this effect to occur. Finally, we probed the relation between direct gaze and emotion processing, showing mutual influences.

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NOTIZEN:

**Reduced guidance of visual attention by physical saliency in social contexts**

Gamer, Matthias

Universität Würzburg, Deutschland

In free viewing conditions, human observers typically show a strong preference for fixating the faces and bodies of conspecifics. However, these studies frequently used highly standardized and thus very restricted static stimuli. Moreover, although several researchers tried to account for potential confounds between social features and physical saliency, previous studies had not sufficiently isolated the unique effect of social content on attentional guidance. Using eye-tracking in a variety of experimental conditions, ranging from free viewing of static naturalistic scenes, via dynamic displays of social situations to real life social interactions, we could show that the influence of physical saliency on attentional orienting declines rapidly as other human beings enter the visual field. In such conditions, human observers preferentially fixate heads and faces of conspecifics even when they are not particularly salient in terms of low-level physical features. Although these effects were more prominent for remote situations (i.e., when observing pictures or videos on a computer screen), they also occurred in real life situations and showed a surprisingly high level of intraindividual stability. These findings indicate that the balance between physical saliency and social content on attentional orienting might be a promising biomarker for psychiatric conditions that are associated with severe deficits in social behavior (e.g., autism spectrum disorders, psychopathy, social anxiety disorders).

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NOTIZEN:



**1.1.2 Intelligence and the brain: Tracking, predicting, and (an attempt to) enhancing IQ [Hörsaal: A2]**

Ulrike Basten, Goethe-Universität Frankfurt

What do intelligent brains look like? Can we tell a person's intelligence from his or her brain? And can we enhance intelligence by manipulating brain function? These questions define the topic of the symposium. The first two talks present different attempts to track intelligence in specific functional and structural properties of the brain. In the first talk, Basten critically reflects the widely-accepted notion of a more efficient brain function in intelligent people by comparing evidence on brain activation during cognitive demand and intrinsic brain network connectivity. Turning to structural features of intelligent brains, Genç reports different correlates for crystallized as opposed to fluid aspects of intelligence. While fluid intelligence was related to cortex volume, general knowledge showed associations with structural brain network connectivity. Hilger takes on the relation between intelligence and structural features of the brain and demonstrates that the multivariate pattern of grey matter volume in the brain can be used to significantly predict individual intelligence scores in previously unseen individuals. Finally, the link between intelligence and the brain can be taken as a basis for an attempt to enhance intelligence by manipulating brain function. Schubert presents a pharmacological intervention study, in which nicotine made people faster yet not more intelligent - a finding contradicting the prevalent assumption that individual differences in mental speed can serve as a causal explanation for differences in intelligence. Taken together, this symposium presents important current approaches and recent advances in the study of the neural basis of human intelligence.

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NOTIZEN:

**Are smart brains really more efficient? A comparison of evidence from studies on fMRI activation and intrinsic connectivity**

Basten, Ulrike

Goethe-Universität Frankfurt, Deutschland

A prominent and widely-accepted view of intelligence holds that the brains of more intelligent people are more efficient. This talk compares empirical evidence for two different conceptualisations of efficiency in association with intelligence: a) Efficiency as a characteristic of brain activation (less brain activation for a given level of cognitive performance) and b) Efficiency as a characteristic of intrinsic brain network organisation (shorter paths from a given node to all other nodes in the brain network). Regarding a) the efficiency of brain activation, a meta-analysis of 14 brain imaging studies yielded 6 brain regions showing a positive and 2 showing a negative association between intelligence and brain activation. In a separate study, we demonstrated that the interpretation of either type of association in terms of neural efficiency critically depends on the functional brain network under consideration (cognitive control versus default mode). Regarding b) the efficiency of network organisation, a graph analysis of intrinsic connectivity during an fMRI resting state suggested no association between intelligence and global efficiency. Instead, we observed brain region-specific associations between intelligence and nodal efficiency. As for the analysis of brain activation, these were partly positive (anterior insula, dorsal anterior cingulate cortex) and partly negative (temporo-parietal junction area). In conclusion, the currently available data suggest that intelligent brains are not generally more efficient – neither with regard to task activation nor with regard to network organisation. The talk will discuss functional brain networks as a potential moderator of the relation between intelligence and brain measures of efficiency.

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NOTIZEN:

## **The neural architecture of general knowledge**

Genç, Erhan; Fraenz, Christoph; Schlüter, Caroline; Güntürkün, Onur

Ruhr Universität Bochum, Deutschland

Cognitive performance varies widely between individuals and is highly influenced by structural and functional properties of the brain. In the past, neuroscientific research was principally concerned with fluid intelligence, while neglecting another vital feature of the human mind: The ability to store and retrieve immense amounts of information, which is likely to determine an individual's level of general knowledge. Here we used standard MRI along with resting state fMRI and DTI to examine different estimates of brain volume and brain network connectivity and assessed their predictive power regarding general knowledge and fluid intelligence. Our results demonstrate that an individual's level of general knowledge is associated with structural brain network connectivity, whereas fluid intelligence is best predicted by the volume of the cortex. These findings were not confounded by the effects of age and sex and probably indicate a differential neural architecture for information storage and information processing within the human brain.

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NOTIZEN:

**Show me your brain and I'll tell you how smart you are: Multivariate prediction of general intelligence from patterns of gray matter volume**

Hilger, Kirsten<sup>1,2</sup>; Winter, Nils R.<sup>3</sup>; Hahn, Tim<sup>3</sup>; Fiebach, Christian J.<sup>1,2,4</sup>; Basten, Ulrike<sup>1</sup>

<sup>1</sup>Goethe University Frankfurt, Germany; <sup>2</sup>IDeA Center for Individual Development and Adaptive Education, Frankfurt am Main, Germany; <sup>3</sup>Universitätsklinikum Münster, Münster, Germany; <sup>4</sup>Brain Imaging Center, Goethe University Frankfurt, Frankfurt am Main, Germany

General intelligence has been associated with individual differences in morphological characteristics of the brain such as gray matter volume (for meta-analyses, see Jung & Haier, 2007; Basten et al., 2015). However, the majority of previous investigations focused on correlative associations, which maximize explained variance within a given sample, without considering generalizability to independent samples. To demonstrate the predictive value of individual differences in morphometric patterns of gray matter volume for intelligence, we applied voxel-based morphometry (VBM) on structural magnetic resonance imaging (MRI) data from 308 adult participants (Nooner et al., 2012). In a regression model controlling for effects of age, sex, and handedness, intelligence (Wechsler Abbreviated Scale of Intelligence) was significantly associated with gray matter volume in inferior frontal gyrus, middle temporal gyrus, lingual gyrus, precuneus, hippocampal region, and cerebellum (sub-sample of  $N = 200$  used for model development). Using linear regression, we demonstrate that the multivariate pattern of gray matter volume within these brain regions significantly predicts individual intelligence scores in the remaining independent sample used for model testing ( $N = 108$ ; correlation between predicted and observed intelligence scores:  $r = .22$ ). Significant prediction was also achieved with a machine learning approach, i.e., support vector regression with 5-fold cross-validation applied to the whole sample (correlation between predicted and observed intelligence scores:  $r = .36$ ). In conclusion, our study provides robust support for the hypothesis that brain structure is associated with general intelligence, and demonstrates the potential for brain-based inferences about cognitive ability at the level of the individual person.

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NOTIZEN:

**Faster equals smarter? A psychopharmacological analysis of the relationship between mental speed and mental abilities**

Schubert, Anna-Lena<sup>1</sup>; Hagemann, Dirk<sup>1</sup>; Frischkorn, Gidon T.<sup>1</sup>; Herpertz, Sabine C.<sup>2</sup>

<sup>1</sup>Institute of Psychology, Heidelberg University, Heidelberg, Germany; <sup>2</sup>Department of General Psychiatry, Center for Psychosocial Medicine, Heidelberg University, Heidelberg, Germany

Individual differences in the speed of information processing have been suggested to give rise to individual differences in general intelligence. Consistent with this hypothesis, reaction times and latencies of event-related potential have been shown to be substantially associated with cognitive abilities. In particular, general intelligence has been most strongly related to the speed and efficiency of information transmission from frontal attention and working memory processes to temporal-parietal processes of memory storage, as measured by latencies of event-related components of the EEG that are associated with higher-order cognitive processes. Theoretical accounts of this association suggest a causal relationship between mental speed and general intelligence in the way that a greater mental speed facilitates information processing and thus contributes to better performance in intelligence tests. However, all of these studies have been correlational in nature. Bridging the fields of correlational and experimental psychology, the present study used a double-blind design to assess the effects of nicotine administration on the speed of information processing and intelligence test performance. While nicotine administration decreased both reaction times and P3 latencies in the Sternberg memory scanning task, there was no effect of nicotine on intelligence test performance. These results contradict theories proposing that a greater speed of information processing causes greater intelligence. Instead, they suggest that some structural or organizational properties of the brain may affect both the speed of information processing and general intelligence and may thus give rise to the association between mental speed and mental abilities.

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NOTIZEN:

### **1.1.3 Voluntary forgetting: basic mechanisms and impact on emotions and mental health [Hörsaal: A3]**

Roland Benoit, Max-Planck-Institut für Kognitions- und Neurowissenschaften

Gerd Waldhauser, Ruhr-Universität Bochum

Episodic memories allow us to revisit cherished past events, yet they can also bring back unpleasant experiences. By involuntarily intruding into awareness, these memories can detrimentally affect our well-being. This symposium provides behavioral, psychophysiological, and neural evidence that we can actively control such unwanted memories via inhibitory control processes that act during both encoding and retrieval. Marie-Christin Fellner will show that directed attempts to forget a just experienced episode lead to an inhibition of the episode's memory representation, as indicated by multivariate analyses of EEG data. Ann-Kristin Meyer will then present evidence that suppressing the retrieval of unwanted memories can reduce the vividness with which they later can be recalled and eventually cause forgetting. She will show how this is accompanied by an attenuation of associated emotional responses. Gerd Waldhauser will present a MEG study on refugees suffering from posttraumatic stress disorder that links their experienced memory intrusions to a deficiency in memory suppression. This deficit is reflected in dysregulated brain oscillations in the gamma frequency band. Davide Stramaccia will then take a bird's eye view on the field of memory suppression by meta-analyzing some of the evidence for voluntary forgetting. By this, he will also ponder the question whether suppression constitutes a beneficial coping mechanism. Finally, Roland Benoit will provide behavioral and fMRI evidence that a mechanism akin to memory suppression can also be engaged for the regulation of persistent and recurrent future fears. Together, the presentations elucidate the neurocognitive mechanisms of voluntary forgetting and highlight its adaptive nature.

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NOTIZEN:

## **Tracking representational similarity and oscillatory correlates of selective rehearsal and active forgetting in EEG**

Fellner, Marie-Christin; Waldhauser, Gerd; Axmacher, Nikolai

Institute of Cognitive Neuroscience, Ruhr Universität Bochum, Deutschland

An essential mechanism in memory is to selectively process memory representations depending on 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 tracked selective encoding by applying multivariate analysis methods to EEG data recorded while participants were asked to selectively remember (R-cue) or forget (F-cue) a newly encoded item. 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.

Neural representations of to be remembered items were upregulated, and representations of actively forgotten items were reduced. Downregulation concurred with increases of alpha power, a marker of cortical inhibition. The current results demonstrate how memory can voluntarily be up- or down-regulated, providing evidence for both, rehearsal and inhibition accounts of selective encoding.

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NOTIZEN:

**Taming aversive memories via retrieval suppression**

Meyer, Ann-Kristin; Benoit, Roland G.

Max-Planck-Institut für Kognitions- und Neurowissenschaften, Germany

When we experience aversive events, these often turn into unwanted memories. Simple reminders can then trigger the involuntary retrieval of these memories. However, prior evidence indicates that we can intentionally suppress the retrieval process to prevent such unwanted memories from entering awareness. Here, we test the hypothesis that suppressing the retrieval of an aversive event impairs the ability to subsequently recall it and, moreover, also affects its autonomic emotional component. Participants learned associations between reminders and aversive scenes. They were then repeatedly presented with the reminders. For some of these, participants were instructed to suppress the retrieval of the associated scene. Such targeted retrieval suppression reduced the vividness with which the avoided memories later could be recalled and eventually even caused forgetting. Critically, we assessed the cardiac response to the retrieval of individual memories (as a psychophysiological marker of participants' emotional response) both before and after suppression. We observed that a reduction in people's ability to recall suppressed memories was accompanied by a change in the cardiac response. These findings tie the weakening of the declarative component of a suppressed memory to a simultaneous change in associated affect.

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NOTIZEN:



**The neural dynamics of deficient memory suppression in heavily traumatized refugees**

Waldhauser, Gerd T.<sup>1</sup>; Dahl, Martin J.<sup>2</sup>; Ruf-Leuschner, Martina<sup>3</sup>; Müller-Bamouh, Veronika<sup>3</sup>; Schauer, Maggie<sup>3</sup>; Axmacher, Nikolai<sup>1</sup>; Elbert, Thomas<sup>3</sup>; Hanslmayr, Simon<sup>4</sup>

<sup>1</sup>Ruhr-Universität Bochum, Deutschland; <sup>2</sup>Max-Planck-Institut für Bildungsforschung, Deutschland; <sup>3</sup>Universität Konstanz, Deutschland; <sup>4</sup>University of Birmingham, United Kingdom

Victims of war, torture and natural catastrophes are prone to develop post-traumatic stress disorder (PTSD). These individuals experience the recurrent, involuntary intrusion of memories of traumatic events. What neurocognitive mechanisms are driving this memory disorder? Here we show that PTSD symptoms in heavily traumatized refugees are related to a neurocognitive deficit in the effective control of memory retrieval. PTSD patients and matched control participants with comparable levels of mental health problems but no PTSD engaged in a think/no-think task that involved the voluntary suppression of unwanted, emotionally neutral memories. In contrast to controls, patients were unable to forget unwanted memories that they had previously tried to suppress. Magnetoencephalography (MEG) recorded during active suppression attempts revealed that PTSD patients were unable to downregulate signatures of sensory long-term memory traces in the gamma frequency band (70-120 Hz). Deficits in voluntary forgetting and dysregulated gamma activity in visual cortical areas correlated with the experience of memory intrusions in everyday life. We were able to isolate these effects from confounding factors such as comorbid depression and number of traumatic experiences in our participants. Thus, our data suggest that the inability to suppress even neutral memories through modulation of gamma activity is related to symptom severity in PTSD.

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NOTIZEN:

## **A meta-analysis of suppression-induced forgetting in neurotypical and clinical populations**

Stramaccia, Davide F.<sup>1</sup>; Fawcett, Jonathan M.<sup>2</sup>; Rischer, Katharina<sup>3</sup>; Benoit, Roland G.<sup>1</sup>

<sup>1</sup>Max-Planck-Institut für Kognitions- und Neurowissenschaften, Germany; <sup>2</sup>Memorial University of Newfoundland, Canada; <sup>3</sup>Université du Luxembourg, Luxembourg

Two decades of research indicate that people are able to prevent unwanted memories from entering awareness. The sustained effort to prevent such memories from coming to mind often impairs their long-term retention, causing forgetting that is stronger than for other memories that were spared from such efforts. This reduction in memory availability is referred to as *suppression-induced forgetting* (SIF). In contrast to common notions of forgetting as an undesirable failure, SIF is considered the behavioral expression of a highly adaptive coping mechanism that promotes focus, emotional stability, and wellbeing. The aims of this meta-analysis are twofold: First, we test whether SIF is a reliable phenomenon in samples of people that typically enjoy good mental health. Second, if SIF is a hallmark of a beneficial coping mechanisms that helps us deal with unwanted memories, it may be reduced in individuals that suffer from psychological disorders that are characterised by involuntary intrusive thoughts (i.e., anxiety and depression). Preliminary results suggest that SIF is indeed a reliable psychological effect that is stronger in healthy individuals than in clinical and sub-clinical samples.

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NOTIZEN:

**Reducing future fears by suppressing the brain mechanisms underlying episodic simulation**

Benoit, Roland G.<sup>1</sup>; Davies, Daniel<sup>2</sup>; Anderson, Michael C.<sup>3,4</sup>

<sup>1</sup>Max-Planck-Institut für Kognitions- und Neurowissenschaften, Deutschland;

<sup>2</sup>University of Cambridge, Department of Psychiatry, UK; <sup>3</sup>Medical Research Council, Cognition and Brain Sciences Unit, UK; <sup>4</sup>University of Cambridge, Behavioural and Clinical Neuroscience Institute, UK

Recurrent simulations of feared future events may contribute to the maintenance of anxiety. In two studies, we tested the hypothesis that people can, in turn, attenuate future apprehensiveness by stopping such simulations via a mechanism akin to memory suppression. Participants repeatedly imagined dreaded events that they feared might happen to them, and suppressed imaginings of other such events. Suppression was associated with an inhibitory signal originating from the right dorsolateral prefrontal cortex (PFC) that modulated activation in the hippocampus and the ventromedial PFC, regions that are critical for future simulations. This mechanism diminished access to details that are typically part of the feared event and further hindered subsequent imaginings. Critically, it reduced future apprehensiveness, with individuals who were more efficient at downregulating their fears by suppression also being less anxious in their everyday life. Suppressing recurrent fear simulations may thus constitute a beneficial coping mechanism.

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NOTIZEN:

#### 1.1.4 The noradrenergic system in ageing and neurodegenerative disease [Hörsaal A4]

Martin J. Dahl<sup>1</sup>, Matthew Betts<sup>2</sup>

<sup>1</sup>Max Planck Institute for Human Development, <sup>2</sup>German Center for Neurodegenerative Diseases (DZNE)

Noradrenaline (NA), a major neuromodulator is implicated in a broad range of cognitive functions such as attention, memory and decision making. Accordingly, states characterized by excessive NA release, for example stress, profoundly affect cognition.

With proceeding age, however, brain structures supporting noradrenergic modulation (namely the Locus Coeruleus, LC) decline and may further degenerate in neurodegenerative disease.

Recent methodological advances allow the in vivo assessment of LC integrity and function using magnetic resonance imaging (MRI) and eye tracking. Here, we present a series of studies that investigate cognitive correlates of noradrenergic dysregulation in healthy and pathological ageing. Lisa Klün (University of Hamburg) will demonstrate the effect of pharmacological noradrenergic modulation on memory generalization in younger adults. Dorothea Hämmerer (University College London / DZNE Magdeburg) will relate altered LC responsiveness and integrity to memory and decision making. Martin Dahl (MPI for Human Development, Berlin) will report spatially confined age differences in rostral LC and their effect on memory in aging based on a large-scale longitudinal assessment. Matthew Betts (DZNE Magdeburg) will demonstrate age differences in LC are non-homogeneous and will relate LC integrity measures to cerebrospinal fluid markers of Alzheimer's disease. Finally, Luca Passamonti (University of Cambridge) will show the effect of pharmacological noradrenergic stimulation on response inhibition in patients suffering from Parkinson's disease.

Together, these studies demonstrate novel avenues to track and manipulate the NA system with promising implications for ageing and clinical research.

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NOTIZEN:

**Noradrenergic Stimulation Impairs Memory Generalization in Women**

Klün, Lisa Marieke<sup>1</sup>; Agorastos, Agorastos<sup>2</sup>; Wiedemann, Klaus<sup>2</sup>; Schwabe, Lars<sup>1</sup>

<sup>1</sup>University of Hamburg, Germany; <sup>2</sup>University Clinic Hamburg-Eppendorf, Germany

Memory generalization is critical for adaptive decision-making and action. Our ability to generalize across past experiences relies on medial-temporal lobe structures, known to be highly sensitive to stress. Recent evidence suggests that stressful events may indeed interfere with memory generalization. Yet, the mechanisms involved in this generalization impairment are unknown. We tested here whether a pharmacological elevation of the major stress mediators-noradrenaline and glucocorticoids is sufficient to disrupt memory generalization. In a double-blind, placebo-controlled design, healthy men and women received orally a placebo, hydrocortisone, the  $\alpha$ 2-adrenoceptor antagonist yohimbine that leads to increased noradrenergic stimulation, or both drugs, before they completed an associative learning task probing memory generalization. Drugs left learning performance intact. Yohimbine, however, led to a striking generalization impairment in women, but not in men. Hydrocortisone, in turn, had no effect on memory generalization, neither in men nor in women. The present findings indicate that increased noradrenergic activity, but not cortisol, is sufficient to disrupt memory generalization in a sex-specific manner, with relevant implications for stress-related mental disorders characterized by generalization deficits.

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NOTIZEN:

## **Using pupillometry and structural imaging to probe the ageing noradrenergic system**

Hämmerer, Dorothea

UCL, London, UK / DZNE Magdeburg, Deutschland

Neuronal loss in noradrenergic (NA) structures of the brain stem (Locus Coeruleus, LC) during ageing is comparable to neuronal loss in dopaminergic nuclei. Animal and pharmacological studies show that noradrenergic modulation supports a wide range of higher cognitive functions, including memory encoding, selective attention, and cognitive flexibility. However, we don't know yet to what extent altered LC function or altered NA modulation impacts cognitive function in ageing. I present results from three studies which investigate the relevance of age differences in LC structure and function for adult age differences in emotional memory and decision making, using structural imaging and pupillometry (pupil dilation can serve as a proxy measure for functional LC responses). Pupillometric data indicate an altered responsiveness of the ageing NA system during memory encoding and decision making. Structural LC measures suggest a likely impact of reduced LC integrity on memory performance in ageing.

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NOTIZEN:

**Locus coeruleus integrity preserves memory performance across the adult lifespan**

Dahl, Martin J.<sup>1</sup>; Düzel, Sandra<sup>1</sup>; Mather, Mara<sup>2</sup>; Lindenberger, Ulman<sup>1</sup>; Kühn, Simone<sup>3</sup>; Werkle-Bergner, Markus<sup>1</sup>

<sup>1</sup>Max Planck Institute for Human Development, Center for Lifespan Psychology; <sup>2</sup>University of Southern California, Davis School of Gerontology; <sup>3</sup>University Clinic Hamburg-Eppendorf, Clinic and Policlinic for Psychiatry and Psychotherapy

With advancing age, memory declines, challenging the lives of elderly people. Animal research indicates that the integrity of the locus coeruleus (LC), the brain's primary noradrenaline (NA) source, is crucially related to age-related declines in cognition.

We analyzed cognitive and neural data of 66 younger ( $\varphi$ 22; aged:  $32.5 \pm 3.6$  years) and 233 older adults ( $\varphi$ 82; aged:  $72.4 \pm 4.1$  years) assessed at two time points (delay:  $2.2 \pm 0.5$  years). We used high-resolution neuromelanin-sensitive structural MRI collected at the second time point to index the structural integrity of the LC and relate it to performance in a verbal memory task.

We established a semi-automatic procedure to estimate individual LC integrity across the rostro-caudal extent of the nucleus. The proposed method is validated using both published LC atlases and manual segmentations.

Our findings indicate spatially confined age-differences in LC integrity in those segments that are connected to key memory structures like the hippocampus. A structural equation modeling approach (SEM) revealed positive associations between LC integrity and learning and memory performance in elderly adults at both the same time point and two years earlier. The present results link non-invasive, in-vivo indices of LC integrity to memory in human aging and extend our knowledge about the role of the LC-NA system in senescent decline.

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NOTIZEN:

**Relationship between locus coeruleus MRI contrast, cognition and CSF biomarkers in ageing and Alzheimer's disease**

Betts, Matthew<sup>1</sup>; Cardenas-Blanco, Arturo<sup>1</sup>; Kanowski, Martin<sup>2</sup>; Wagner, Michael<sup>3</sup>; Heneka, Michael<sup>3</sup>; Spottke, Annika<sup>3</sup>; Teipel, Stefan<sup>3</sup>; Schneider, Anja<sup>3</sup>; Peters, Oliver<sup>4</sup>; Priller, Josef<sup>4</sup>; Wiltfang, Jens<sup>4</sup>; Laske, Christoph<sup>5</sup>; Jessen, Frank<sup>3</sup>; Düzel, Emrah<sup>1</sup>

<sup>1</sup>German Center for Neurodegenerative Diseases (DZNE), Magdeburg, Germany; <sup>2</sup>Department of Neurology, University Hospital of Magdeburg, Otto-von-Guericke-University Magdeburg, Magdeburg, Germany; <sup>3</sup>German Center for Neurodegenerative Diseases (DZNE), Bonn, Germany; <sup>4</sup>German Center for Neurodegenerative Diseases (DZNE), Berlin, Germany; <sup>5</sup>German Center for Neurodegenerative Diseases (DZNE), Tübingen, Germany

The occurrence of abnormal tau in the locus coeruleus (LC) may be a critical early step in the pathogenesis of Alzheimer's disease (AD). The high content of neuromelanin in the LC serves as an endogenous contrast agent for magnetic resonance imaging (MRI) providing a unique opportunity to assess the integrity of the LC *in vivo*. I will present a novel approach to investigate the human LC *in vivo* using T<sub>1</sub>-weighted Fast Low Angle Shot (FLASH) MRI at 3 T. Using high-resolution isotropic imaging, our initial study aimed to characterise the rostrocaudal distribution of LC signal intensity attributed to neuromelanin in young and older adults. We found age-related differences in LC signal intensity were not homogenous but instead were confined to the rostral third of the LC with relative sparing of the caudal portion. I will also present baseline data from the DZNE *Longitudinal Cognitive Impairment and Dementia (DELCODE)* study investigating how the human LC may be differentially affected in aging and in neurodegenerative disease by assessing LC signal intensity changes in subjective cognitive complainers (SCD), individuals with mild cognitive impairment (MCI) and AD patients compared to age-matched controls. Finally I will discuss how LC signal intensity relates to cognitive and cerebrospinal fluid (CSF) biomarkers of AD to show changes in LC neuromelanin identified using T<sub>1</sub>-weighted FLASH imaging may relate to CSF amyloid status.

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NOTIZEN:



**Noradrenergic enhancement to restore response-inhibition networks and treat impulsivity in Parkinson's disease and other Parkinsonian disorders**

Passamonti, Luca; Lansdall, Claire J; Rowe, James B.

University of Cambridge, Department of Clinical Neurosciences, United Kingdom

Parkinson's disease (PD) and other Parkinsonian disorders such as progressive supranuclear palsy (PSP) impair response-inhibition and cause impulsivity and behavioural dysinhibition. These problems are distressing aspects of both PD and PSP and when coupled with balance and swallowing difficulties, they can increase the risk of falls and injury. Impulsivity in PD and PSP typically coexists with rigidity, bradykinesia, and apathy and is not relieved or can even be worsened by dopaminergic therapies. Impulsivity in PD and PSP is a complex behavioural construct, with dissociable neuroanatomical and pharmacological mechanisms that together impair response-inhibition, reward-sensitivity, and decision-making.

Based on pre-clinical models and human neuropathological data, we propose that noradrenergic denervation, resulting from degeneration of the locus coeruleus, contributes to response-inhibition deficits and impulsivity in PD and PSP, via changes in the prefrontal cortex and its subcortical connections. Past work in PD found that atomoxetine, a noradrenaline re-uptake inhibitor, improved response-inhibition, gambling decisions, and reflection impulsivity. We also demonstrated that atomoxetine can restore the brain networks mediating action cancellation in PD, and that variability in both structural and functional connectivity mediated this behavioural effect.

Our studies support future clinical trials not only in their psycho-pharmacology, but also through stratification and the development of novel mechanistically informative assessment tools based on measures of brain anatomy and function. The results from our research may also promote new therapeutic strategies for other neurodegenerative disorders associated with noradrenergic deficits and impulsivity including the frontotemporal lobar degeneration (FTLD) spectrum and Huntington's disease (HD).

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NOTIZEN:

### **1.1.5 Emotion and Self Processing in the Brain across the Sleep-Wake Cycle [Hörsaal A5]**

Cornelia Herbert, Universität Ulm  
Christine Blume, Universität Salzburg

Without doubt, emotional experiences “spice up” our lives, they are extremely prominent and once consolidated memories will shape future behaviour and experiences. But how does their prominence come about and why do we remember them so well? One hypothesis is that the prominence of emotional experiences results from their self-relevance. In this context, Herbert et al. and Winter et al. will present results from studies investigating the interaction between self- and emotion-related processes during supra- and subliminal stimulus presentation. Results suggest that when awake, self-relevance impacts emotional processing at the level of stimulus encoding and memory updating, however only under conditions of full stimulus awareness. Conversely though, Blume and colleagues find that conscious stimulus awareness may not always be necessary. When investigating processing of self-relevant and emotional stimuli during sleep, they find that brain responses are still tuned to emotional stimulus salience. This suggests a “sentinel processing mode” of the brain during sleep, i.e. in the absence of behavioural responsiveness, which is characterised by continued monitoring of the environment. But what does sleep do to emotional contents encoded during wakefulness? Adopting this bridging perspective, Sopp and colleagues will conclude this symposium by presenting data on the sleep-dependent consolidation of emotional memory contents encoded during wakefulness. Their results suggest that consolidation processes during REM sleep support the retention of emotional associative memory. The presentation will end with an outlook on the relevance of REM-sleep-related processes in posttraumatic stress disorder.

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NOTIZEN:

**Self-related processing of emotional stimuli during wakefulness**

Herbert, Cornelia

Universität Ulm, Deutschland

Emotional stimuli capture attention, are deeper encoded and remembered better than neutral stimuli. Appraisal theory suggests that emotional stimuli are processed in a facilitated manner due to their self-relevance. In this view, any stimulus - be it words or pictures - is first scanned for its relevance prior to conscious and effortful in depth semantic processing. Self-relevance appraisal is therefore hypothesized to be fast and quick, probably occurring without self-awareness. In this talk, results from a series of EEG studies will be presented investigating the temporal dynamics of emotional stimulus processing and its modulation by stimulus relevance during passive viewing and during self-focused attentive and inattentive stimulus processing. Stimulus-relevance was elicited by means of self-referential pronouns (SRP) varying from first to second to third person perspectives. Emotional stimuli consisted of nouns of positive, negative and neutral content. Facilitated processing of SRPs was investigated in separate studies. The results show that during wakefulness healthy participants rapidly distinguish between first person (1PP) vs. third person (3PP) pronouns supporting fast stimulus-driven self-other discrimination as is typical for highly salient self-relevant stimuli such as the subject own face or own name. Despite this, differential processing of self- vs. other-related emotional content occurs first at about 400 - 500 ms after stimulus presentation, irrespective of task-related processing. Hence, during wakefulness, assignment of self-relevance to emotional stimuli varying in self-reference is a dynamic process, elicited while information passes through different processing levels from low perceptual stages to higher levels of integrated multisensory and multimodal information processing.

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NOTIZEN:

## **Self-reference processing during supra- and subliminal stimulus presentation of emotional words**

Winter, Dorina<sup>1,2</sup>; Steeb, Leah<sup>2</sup>; Herbert, Cornelia<sup>3</sup>; Schmahl, Christian<sup>2</sup>; Bohus, Martin<sup>4</sup>; Lis, Stefanie<sup>4</sup>

<sup>1</sup>Department of Clinical Psychology and Psychotherapy, University Koblenz-Landau, Landau, Germany; <sup>2</sup>Department of Psychosomatic Medicine and Psychotherapy, Central Institute of Mental Health, Medical Faculty Mannheim / Heidelberg University, Mannheim, Germany; <sup>3</sup>Department of Psychology and Education, University of Ulm, Ulm, Germany; <sup>4</sup>Department of Psychosomatic Medicine and Psychotherapy, Central Institute of Mental Health, Medical Faculty Mannheim / Heidelberg University, Mannheim, Germany

People's appraisal of emotional information depends on the information's reference to themselves. Yet, little is known whether reference information needs to be processed consciously to influence a persons' information appraisal. Thus, this study examines whether the interaction of reference context and emotional information in appraisal processes depends on whether the reference information is presented supra- or subliminally. Methods were applied to healthy participants and a clinical group with borderline personality disorder. Participants rated negative, positive and neutral words paired with self-, other- or no reference. Reference information was presented either supra- or subliminally.

In both groups, reference information influenced the evaluation of words only in the supraliminal presentation condition. Result suggest that emotional information with self-reference is evaluated more extremely emotional than information with reference to another person. Participants with borderline personality disorder moreover showed a diminished self-positivity bias for positive information. The association with self-esteem supports the clinical relevance of this observation in participants with borderline personality disorder.

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NOTIZEN:

## **A “Sentinel Processing Mode” of the Brain during Sleep? Insights from Emotional Stimulus Processing**

Blume, Christine<sup>1,2</sup>; Del Giudice, Renata<sup>1,2</sup>; Wislowska, Malgorzata<sup>1,2</sup>; Heib, Dominik PJ<sup>1,2</sup>; Schabus, Manuel<sup>1,2</sup>

<sup>1</sup>University of Salzburg, Department of Psychology, Laboratory for Sleep, Cognition and Consciousness Research; <sup>2</sup>University of Salzburg, Centre for Cognitive Neuroscience Salzburg (CCNS)

Early theories have suggested that the brain is “shielded” or “shut off” from the environment during sleep. A different perspective however highlights the importance of an interaction between the brain state and stimulus properties for the brain’s response to external stimuli. The aim of this study therefore was to investigate how emotional stimulus characteristics relate to processing during sleep. Specifically, we studied this interaction by means of evoked oscillatory responses (event-related de-/synchronisation) and event-related potentials using electroencephalography (EEG) during wakefulness and across different sleep stages (i.e. non-rapid eye movement (NREM) sleep stages N1-N3 and REM sleep). We varied emotional stimulus salience on two dimensions, (i) subjective relevance and (ii) paralinguistic emotional aspects. To this end, we presented participants with their own names (ONs) vs. unfamiliar names (UNs) and additionally varied the familiarity of the voice, i.e. familiar vs. unfamiliar voice (FV vs. UFV) or the prosody, namely neutral vs. angry prosody (NP vs. AP). We show that subjective relevance, familiarity of voice and prosody continue to be evaluated during sleep with especially AP and UFV stimuli consistently being associated with stronger EEG responses, even during deep (N3) and REM sleep. We therefore propose that the brain switches to a “sentinel processing mode” during sleep, i.e. it continues to evaluate environmental stimuli even in the absence of behavioural responsiveness. Beyond this and unlike previously proposed, sleep-specific oscillatory phenomena (i.e. sleep spindles and slow oscillations) do not seem to uniformly inhibit information processing. Rather, inhibition seems to be tuned to emotional stimulus salience.

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NOTIZEN:

**The role of REM sleep in emotional memory consolidation: Effects on item and associative memory**Sopp, Marie Roxanne<sup>1</sup>; Michael, Tanja<sup>1</sup>; Mecklinger, Axel<sup>2</sup>

<sup>1</sup>Abteilung für Klinische Psychologie und Psychotherapie, Universität des Saarlandes, Deutschland; <sup>2</sup>Arbeitseinheit Experimentelle Neuropsychologie, Universität des Saarlandes, Deutschland

The emotional significance of events profoundly alters the way in which these events are retained in episodic memory. Following encoding, emotional memories are assumed to undergo preferential consolidation, resulting in enhanced retrieval across time. Recent accounts suggest that preferential consolidation of emotional material occurs during sleep. More specifically, REM sleep physiology has been linked with enhanced item recognition for emotional stimuli. However, it is currently unclear whether these processes also support the retrieval of emotional associations in source and associative recognition tests. This issue was addressed by investigating the effects of rapid eye movement (REM) sleep and slow wave sleep (SWS) on item and source memory of (non-)emotional stimuli (Experiment 1). We found that source memory (location) was differentially modulated across SWS and REM sleep, suggesting a selective preservation of emotional source memory during REM sleep. This interpretation was supported by a selective correlation between emotional source memory performance and a specific oscillatory feature of REM sleep (theta oscillations). As intrinsic item features (e.g. location) are assumed to undergo prioritized processing during encoding of emotional stimuli, we conducted a second experiment (Experiment 2) to test whether REM-sleep-related processes also support the retention of extrinsic associations (object-scene pairs). Analyses did not yield any direct evidence of an involvement of REM-sleep-related processes. In conclusion, the current findings support a role of REM-sleep-related processes in emotional memory consolidation. Interestingly, these processes may be relevant in psychiatric disorders hallmarked by disruptions of episodic memory (e.g. posttraumatic stress disorder).

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NOTIZEN:

**1.2 Keynote 1: 13:30-14:30 Uhr; Tor Wager: Neuroimaging of pain and emotion: Computation, representation, and regulation  
[Hörsaal A1]**

Tor Wager

Cognitive and Affective Neuroscience Lab, University of Colorado at Boulder, USA

Pain and emotion are central to human life. Their experience defines our wellbeing, and the brain processes that underlie them drive behavior and learning. Developing the capacity to influence them, and sometimes to accept them, motivates human endeavors ranging from spiritual practices to medical interventions. Developing models of the brain systems that generate pain and emotion could transform how we understand their neurophysiological origins, and how we understand interventions ranging from psychotherapy to self-regulation to drug effects. However, developing such models will require computational advances, particularly in our ability to model how emergent properties like pain arise from complex interactions among brain systems, and how to construct such models so that they have high neuroscientific interpretability, predictive validity, and reproducibility. In this talk, I describe a series of studies aimed addressing these goals. Combining functional neuroimaging with machine learning techniques, we have developed brain models capable of predicting the intensity of pain, negative affect, empathy, and autonomic activity in individual participants, with no prior knowledge about the individual's experience. I will show how these models can serve as measures of the brain processes that generate pain and emotion, and how interrogating the structure of these models and relationships among them can provide insight into how the brain represents multiple varieties of affective experience. Finally, I will show how these models allow us to compare diverse interventions on a level playing field, shedding light on how both cognitive and drug interventions work and how they might be inter-related.

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NOTIZEN:

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NOTIZEN:



## 1.3 Symposienblock II: 14:45-16:15 Uhr

### 1.3.1 Neurobiologische Grundlagen von kontextabhängigen Lern- und Gedächtnisprozessen [Hörsaal A1]

Christian J. Merz, Ruhr-Universität Bochum

Kontextuelle Reize bestimmen unseren Alltag und spielen eine wichtige Rolle in der Auswahl, Initiierung und Aufrechterhaltung adäquaten Verhaltens in unterschiedlichen Situationen. Experimentalpsychologisch lässt sich der Kontext vielfach manipulieren, wie z.B. durch visuelle, olfaktorische oder taktile Komponenten. Neben diesen exterozeptiven und räumlichen Komponenten eines Kontexts werden auch interozeptive Komponenten wie beispielsweise Veränderungen im Organismus über den Verlauf der Zeit als Kontextfaktoren diskutiert. Die neurobiologische Charakterisierung von kontextabhängigen Lern- und Gedächtnisprozessen dient dem besseren Verständnis unterschiedlicher alltäglicher Kontextphänomene, die auch eine besondere Relevanz für klinisch-psychologische Fragestellungen haben.

Im Rahmen dieses Symposiums sollen unterschiedliche Zugänge zur Untersuchung dieser Phänomene beleuchtet und kritisch diskutiert werden. In einem ersten Beitrag (Üngoer) werden Ergebnisse aus instrumentellen Konditionierungsstudien bei Ratten veranschaulicht, wobei in einer Testphase kontextuelle Reize entweder hinzugefügt oder entfernt wurden umso die elementare von der konfiguralen Kontextrepräsentation abzugrenzen. Der darauffolgende Vortrag (Zlomuzica) wird sich episodischen Gedächtnisinhalten im Tier- und Humanbereich widmen und veranschaulichen inwiefern kontextuelle Reize hierbei eine Rolle für adaptives und maladaptives Verhalten spielen. Der dritte Vortrag (Timmann) wird die differenzielle Funktion unterschiedlicher Kleinhirnanteile bei kontextabhängigen Furchtkonditionierungsprozessen, insbesondere im Extinktionsnetzwerk thematisieren. Der abschließende Beitrag (Neudert) wird die neurobiologischen Grundlagen von kurz- und langfristigen Furchtextinktionsabrufprozessen in einer Stichprobe von Patienten mit einer sozialen Angststörung illustrieren.

Dieses Symposium liefert einen wichtigen, translationalen Beitrag zu einem besseren Verständnis der Kontextabhängigkeit von unterschiedlichen Lern- und Gedächtnisprozessen, die zu adaptiven oder maladaptiven Verhaltensweisen führen. Es ist ein Ergebnis gemeinsamer Aktivitäten des SFB 1280: Extinction Learning.

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NOTIZEN:

## **Kontextabhängigkeit instrumentellen Verhaltens**

Üngör, Metin<sup>1</sup>; Nieto, Javier<sup>2</sup>; Bernal-Gamboa, Rodolfo<sup>2</sup>

<sup>1</sup>Philipps-Universität Marburg, Deutschland; <sup>2</sup>Universidad Nacional Autónoma de México, Mexiko

Instrumentelle Konditionierung bildet eine Grundlage für zielgerichtetes Verhalten und befähigt Organismen dazu, ihre Umwelt zu kontrollieren und zu manipulieren. Wenn ein Verhalten zu einer angenehmen Konsequenz führt, dann erhöht sich die Wahrscheinlichkeit für dieses Verhalten. Hingegen sinkt die Wahrscheinlichkeit für ein Verhalten, wenn dieses in der Vergangenheit mit unangenehmen Konsequenzen verbunden war. Der Kontext, in dem instrumentelles Verhalten gelernt wurde, spielt für die Verhaltensmodulation eine zentrale Rolle. In zwei Experimenten haben wir untersucht, wie sich das Hinzufügen und Entfernen kontextueller Reize auf die Generalisierung instrumentellen Verhaltens bei Ratten auswirken. In den Experimenten wurde zunächst eine stabile Hebeldruckrate etabliert, indem Ratten für das Drücken eines Hebels mit Futter verstärkt wurden. Diese Akquisition fand in einem charakteristischen Kontext statt, der bestimmte visuelle, taktile und olfaktorische Merkmale aufwies. Dieser Akquisitionskontext wurde für einen anschließenden Generalisierungstest verändert. Dabei wurde die Kontextveränderung entweder dadurch realisiert, dass dem Akquisitionskontext neue Kontextmerkmale hinzugefügt wurden, oder dadurch, dass Kontextmerkmale des Akquisitionskontexts entfernt wurden. Wir beobachteten eine perfekte Generalisierung instrumentellen Verhaltens in der Testbedingung, in der Kontextmerkmale hinzugefügt wurden. In der Testbedingung, in der Kontextmerkmale entfernt wurden, kam es hingegen zu einem Rückgang der Hebeldruckrate. Unsere Befunde bestätigen die Vorhersagen von Theorien des assoziativen Lernens, welche eine elementare Kontextrepräsentation annehmen.

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NOTIZEN:

## **Das episodische Gedächtnis: Mechanismen, Funktionen und klinische Implikationen**

Zlomuzica, Armin

Ruhr-Universität Bochum, Deutschland

Das episodische Gedächtnis bezieht sich auf einzigartige, persönliche Ereignisse bezüglich dessen, was sich ereignet hat und wann und wo sich dieses Ereignis zugetragen hat. Im Gegensatz zu anderen Gedächtnissystemen beinhalten episodische Gedächtnisinhalte Informationen über die räumlichen und zeitlichen Kontextfaktoren, die mit der Enkodierung spezifischer Ereignisinformationen verknüpft sind. In den letzten Jahren wurden neue Verfahren etabliert, mit denen de novo episodische Gedächtnisinhalte unter standardisierten Laborbedingungen erzeugt und gemessen werden konnten. Dies eröffnete die Möglichkeit zu untersuchen, wie einzelne multimodale Komponenten episodischer Gedächtnisinhalte (u. a. temporale und räumliche Kontextinformationen) auf neuronaler und molekularer Ebene verarbeitet und integriert werden. In diesem Vortrag werden bisherige Erkenntnisse über die neurobiologischen Grundlagen episodischer Gedächtnisfunktionen bei Menschen und Tieren zusammengefasst und diskutiert. Darüber hinaus sollen im Rahmen des Vortrags die adaptiven Funktionen und klinischen Implikationen episodischer Gedächtnisleistung näher beleuchtet werden.

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NOTIZEN:

## **Die Rolle des Kleinhirns im Extinktionsnetzwerk**

Timmann, Dagmar

Uniklinikum Essen, Universität Duisburg-Essen, Deutschland

Es gibt eine Reihe von tier- und humanexperimentellen Befunden, die zeigen, dass das Kleinhirn am Erlernen von Furcht beteiligt ist. Es ist davon auszugehen, dass die Teile im Gehirn, die an Lern- und Speicherprozessen beteiligt sind, auch eine Rolle bei der Extinktion spielen. Tatsächlich wurde die mögliche Rolle des Kleinhirns für die Extinktion von gelernter Furcht bisher weitestgehend ignoriert. Im Vortrag werden theoretische Überlegungen und erste experimentelle Ergebnisse vorgestellt, wie das Kleinhirn in das bekannte Extinktionsnetzwerk eingebunden sein könnte. Dabei übernehmen unterschiedliche Kleinhirnanteile möglicherweise verschiedene Aufgaben. Da Tier- und Humanexperimente zeigen, dass der Kleinhirnwurm (Vermis) an der Akquisition von autonomen Furchtreaktionen beteiligt ist, ist anzunehmen, dass der Vermis auch eine Rolle bei der Extinktion von autonomen Reaktionen spielt. Die posterolateralen, „kognitiven“ Anteile des Kleinhirns spielen dagegen möglicherweise eine Rolle bei der Akquisition und Extinktion von kognitiven Anteilen gelernter Furcht. Darüber hinaus könnte das Kleinhirn bei kontextabhängigen Extinktionsprozessen eine Rolle spielen. Dafür sprechen strukturelle und funktionelle Verbindungen des Kleinhirns mit dem Hippocampus, dem dorsolateralen, aber möglicherweise auch mit dem ventromedialen präfrontalen Kortex, und dem anterioren Gyrus cinguli. Da die posterolateralen Kleinhirnhemisphären (und ihre Ausgangskerne, die Ncl. dentati) die stärksten Verbindungen mit zerebralen Arealen haben, kommt ihnen für die postulierten kontextabhängigen Prozesse wahrscheinlich auch die größte Bedeutung zu. Schließlich gibt es erste tierexperimentelle Hinweise darauf, dass die Kleinhirnkerne und die Amygdala während der Extinktion direkt interagieren. Erste eigene funktionelle Bildgebungsdaten werden vorgestellt, die die wichtige Rolle des Kleinhirns bei Extinktionsprozessen von gelernter Furcht beim Menschen unterstützen.

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NOTIZEN:

## **Neuronale Korrelate des kurz- und langfristigen Extinktionsabrufs bei Sozialer Angststörung**

Neudert, Marie K.; Zehner, Raphaela I.; Kruse, Onno; Stark, Rudolf; Hermann, Andrea

Justus-Liebig-Universität Gießen, Deutschland

Für die Ätiologie der Sozialen Angststörung (SAD) spielen aversive soziale Lernerfahrungen eine wichtige Rolle. In der Literatur wird neben einer verstärkten Furchtakquisition auch eine reduzierte Extinktion konditionierter Furcht als zentraler Mechanismus der SAD angenommen. Der Fokus dieser Studie liegt neben der Furchtakquisition und dem Extinktionstraining insbesondere auf der Untersuchung der neuronalen Korrelate des kurz- und langfristigen Extinktionsabrufs, da dieser bisher kaum untersucht wurde. Im Rahmen einer funktionellen Magnetresonanztomographie-Untersuchung durchliefen 36 SAD-Patienten und 39 gesunde Kontrollpersonen ein differentielles Furchtkonditionierungsparadigma mit einer Furchtakquisitionsphase am ersten Tag, einem Extinktionstraining (24 Stunden später), einem kurzfristigen Extinktionsabruf (nach 1 Woche) und einem langfristigen Extinktionsabruf sowie einer Reakquisitionsphase (nach 4 Monaten). Neutrale Gesichtsausdrücke dienten als konditionierte Stimuli und Videoausschnitte mit beleidigenden Kommentaren derselben Personen als unkonditionierte Stimuli. In Kontrast zu gesunden Kontrollpersonen wiesen SAD-Patienten eine reduzierte differentielle Aktivierung des ventromedialen präfrontalen Kortex während der Furchtakquisition sowie eine stärkere Reduktion der Aktivierung im dorsalen anterioren cingulären Kortex während des Extinktionslernens auf. Während des kurzfristigen Extinktionsabrufs zeigten SAD-Patienten tendenziell eine stärkere Amygdala- und während des langfristigen Extinktionsabrufs eine geringere Hippocampus-Aktivierung als gesunde Kontrollpersonen. Die Unterschiede zwischen gesunden Kontrollpersonen und SAD-Patienten in der Aktivierung von furchtverarbeitenden und gedächtnisrelevanten Gehirnregionen deuten auf ein verstärktes Furchtlernen und defizitäre Extinktionsprozesse hin, die mit der Entwicklung und/oder Aufrechterhaltung der Störung in Verbindung stehen könnten.

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NOTIZEN:

### 1.3.2 Emotionsregulation: Psychobiologische Korrelate und interindividuelle Unterschiede [Hörsaal A2]

Valerie Kinner, Ruhr-Universität Bochum

Andrea Hermann, Justus-Liebig-Universität Gießen

Emotionsregulation ist essentiell für die psychische Gesundheit und adaptives Verhalten in psychosozialen Kontexten. Der flexible Einsatz verschiedener Emotionsregulationsstrategien spielt dabei eine zentrale Rolle, denn die Strategien wirken sich nicht nur unterschiedlich auf subjektive, neuronale und physiologische Aspekte der emotionalen Reaktion aus sondern scheinen auch im Kontext erhöhter Stresshormonlevel und unter Berücksichtigung von Persönlichkeitsmerkmalen unterschiedlich mit Emotionsregulationserfolg in Zusammenhang zu stehen. In diesem Symposium soll neben der Charakterisierung zugrundeliegender psychobiologischer Prozesse insbesondere auf die Bedeutsamkeit interindividueller Unterschiede in der Emotionsregulation eingegangen werden. In einem ersten Vortrag (Zähringer et al.) wird eine strukturierte Meta-Analyse vorgestellt, in der die Effekte verschiedener Emotionsregulationsstrategien auf psychophysiologische Maße wie Hautleitfähigkeit, Herzfrequenz und den emotions-modulierten Lidschlagreflex untersucht wurden. Ein weiterer Beitrag (Dörfel et al.) beschäftigt sich damit, inwiefern Persönlichkeitsmerkmale (Big Five) mit subjektivem Regulationserfolg und Amygdalaaktivierung während der Emotionsregulation assoziiert sind. Auch der nächste Vortrag beschäftigt sich mit interindividuellen Unterschieden und neuronalen Korrelaten der Emotionsregulation (Zehner et al.). In dieser funktionellen Magnetresonanztomographie-(fMRT-) Studie wurde der Frage nachgegangen, inwiefern Trait-Empathie mit neuronalen Korrelaten der sozialen Distanzregulation beim Betrachten emotionaler Bilder zusammenhängt. Emotionsregulation spielt insbesondere in stresshaften Situationen und im klinischen Kontext bei der Entwicklung psychischer Störungen eine zentrale Rolle. Im nächsten Vortrag (Gärtner et al.) wird darauf eingegangen, ob maladaptive und adaptive Emotionsregulationsstrategien bei Rettungsdienstmitarbeitern mit Stress und Symptombelastung assoziiert sind. Darauf aufbauend wird im letzten Beitrag (Kinner et al.) näher beleuchtet, inwiefern sich Stresshormone (Cortisolgabe) in Abhängigkeit des Geschlechts auf die neuronalen Korrelate von Emotionsregulation auswirken.

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NOTIZEN:

**Periphere psychophysiologische Effekte der expliziten Emotionsregulation: Ergebnisse einer strukturierten Meta-Analyse**

Zähringer, Jenny; Jennen-Steinmetz, Christine; Ende, Gabriele; Schmahl, Christian; Paret, Christian

Zentralinstitut für seelische Gesundheit, Deutschland

Psychophysiologische Maße bieten eine kostengünstige und - im Vergleich zu funktionellen Bildgebungsmethoden - relativ einfache Möglichkeit zur objektiven Messung der Emotionsregulation. Das Problem bei der Interpretation dieser Befunde ist jedoch, dass bisherige Studien sehr heterogene und zum Teil inkonsistente Effekte berichten. In einer von uns durchgeführten strukturierten Literaturrecherche (Zähringer et al., under review) wurden deshalb erstmals Studien identifiziert, welche die Effekte verschiedener psychophysiologischer Maße wie z.B. Hautleitfähigkeit, Herzfrequenz und den emotions-modulierten Lidschlagreflex im Kontext expliziter Emotionsregulation untersuchen. Meta-Analysen wurden jeweils getrennt nach psychophysiologischem Maß und Emotionsregulationsstrategie berechnet. Die Ergebnisse zeigen, dass das Herabregulieren negativer Emotionen eine Inhibition des emotions-modulierten Lidschlagreflexes zur Folge hat, wobei die Effektgrößen hier im mittleren bis oberen Bereich liegen. Die Suppression von emotionalem Gesichtsausdruck, Gedanken oder Gefühlen, nicht aber die Herabregulation mittels kognitiver Neubewertung, verursacht eine signifikante Erhöhung der Hautleitfähigkeit sowie eine signifikante Reduktion der Herzfrequenz, mit Effektgrößen im niedrigen Bereich. Hierbei zeigen sich außerdem Unterschiede zwischen Innersubjekt- und Zwischensubjektstudien in der Signifikanz der Effekte. Die Ergebnisse weisen darauf hin, dass der emotions-modulierte Lidschlagreflex ein geeignetes Maß zur Erfassung von Emotionsregulation darstellt. Hautleitfähigkeit und Herzfrequenz hingegen scheinen nur bedingt geeignet. Ferner zeigen die Ergebnisse, dass die Herabregulation mittels kognitiver Neubewertung kaum oder keine Veränderung in der Herzfrequenz und Hautleitfähigkeit zur Folge hat und sich damit durch diese Maße nur schwer abbilden lassen.

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NOTIZEN:

## **Erfolgreiche Emotionsregulation und die Big Five – Keine oder nur schwache Zusammenhänge in experimentellen fMRT-Studien?**

Dörfel, Denise<sup>1</sup>; Gärtner, Anne<sup>1</sup>; Scheffel, Christoph<sup>1</sup>; Paschke, Lena<sup>2</sup>; Stelzel, Christine<sup>3</sup>; Walter, Henrik<sup>2</sup>; Strobel, Alexander<sup>1</sup>

<sup>1</sup>Technische Universität Dresden, Fakultät Psychologie, Deutschland; <sup>2</sup>Charité Universitätsmedizin Berlin, Deutschland; <sup>3</sup>International Psychoanalytic University

Zusammenhänge zwischen Persönlichkeitsmerkmalen und Emotionsregulationsfähigkeiten sind in Fragebogenstudien gut untersucht. Habituelles Neubewerten ist eng mit Neurotizismus und Extraversion korreliert. Auch Offenheit und Gewissenhaftigkeit zeigen moderate Assoziationen mit Neubewerten. Experimentelle (fMRT) Studien sind allerdings rar. Eine Studie konnte Emotionsregulationserfolg durch Neurotizismus, Gewissenhaftigkeit und Offenheit sowie neuronaler Aktivierung in der Amygdala vorhersagen. In 3 separaten Studien untersuchten wir deshalb, ob Persönlichkeitsmerkmale mit subjektivem Emotionsregulationserfolg sowie der Amygdalaaktivität während Emotionsregulation (ER) in Zusammenhang stehen. In allen Studien sollten die Probanden ihre Emotionen zulassen oder regulieren, während sie negative und neutrale Bilder sahen, sowie Fragebögen zur dispositionalen Emotionsregulation und den Big Five ausfüllen. Subjektiver ER Erfolg wurde in Studie 1 (N = 85) mittels post-hoc Erregungsratings erfasst, in Studie 2 (N = 171) und 3 (N = 125) mittels trial-by-trial Ratings. Studien 1 und 3 untersuchten zusätzlich die Gehirnaktivierung mittels fMRT (3T Siemens Tim Trio). Standard-Preprocessing und statistische Analyse unter Verwendung des GLM wurde mit SPM 8 durchgeführt. Peak-Amygdala (de)-Aktivierung während ER repräsentiert den neuronalen ER-Erfolg. Dispositionelle ER, Alter und Geschlecht sowie die Big Five gingen in ein hierarchisches, multiples Regressionsmodell mit subjektivem bzw. neuronalem ER-Erfolg als Outcome ein. Nur Verträglichkeit zeigte in allen Studien einen moderaten prädiktiven Beitrag zur Varianzaufklärung im subjektiven Regulationserfolg. In Studie 2 ergab sich ein signifikanter Zusammenhang zwischen Gewissenhaftigkeit und neuronalem ER-Erfolg. In Studie 3 zeigten keine Persönlichkeitsvariablen einen signifikanten Beitrag zur Varianzaufklärung. Der Mangel an publizierten, experimentellen Studien zum Zusammenhang zwischen Big Five und erfolgreicher Emotionsregulation könnte auf einen Publikationsbias hinweisen. Tatsächliche Zusammenhänge sind möglicherweise kaum vorhanden.

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NOTIZEN:



## Neuronale Korrelate von Empathie und Emotionsregulation

Zehner, Raphaela Isabella<sup>1</sup>; Mier, Daniela<sup>2</sup>; Fenske, Sabrina<sup>2</sup>; Neudert, Marie K.<sup>1</sup>; Stark, Rudolf<sup>1</sup>; Hermann, Andrea<sup>1</sup>

<sup>1</sup>Professur für Psychotherapie und Systemneurowissenschaften und Bender Institute of Neuroimaging, Justus-Liebig-Universität Gießen; <sup>2</sup>Zentralinstitut für Seelische Gesundheit, Mannheim

Als sozial agierendes Wesen ist der Mensch darauf angewiesen, empathisch auf andere zu reagieren. Dabei ist auch ein adaptiver Einsatz kognitiver Emotionsregulationsstrategien wichtig, z. B. um sich in eine andere Person hineinversetzen oder sich von einer Person distanzieren zu können. Bildgebende Studien weisen darauf hin, dass kognitive Emotionsregulation und emotionale Empathie sowohl überlappende (z. B. ventromedialer präfrontaler Kortex, vmPFC) als auch distinkte (z. B. inferiorer parietaler Sulcus) neuronale Korrelate aufweisen. In dieser funktionellen Magnetresonanztomographie-Studie wurde untersucht, inwiefern interindividuelle Unterschiede in emotionaler Empathie mit der Gehirnaktivierung während Emotionsregulation zusammenhängen. Dazu wurden 35 Probanden instruiert, Bildmaterial von alltäglichen Szenen und von leidenden Personen entweder zu betrachten oder sich vorzustellen, dass es sich bei der Person um eine ihnen nahestehende oder fremde Person handelt. Zusätzlich gaben die Probanden das Ausmaß ihrer negativen Gefühle nach der Bildpräsentation an. Die Ergebnisse zeigten, dass ein höheres Empathieerleben beim Betrachten aversiver vs. neutraler Bilder mit einer höheren Aktivierung in emotionsassoziierten Gehirnregionen (z. B. Amygdala) sowie Teilen des Spiegelneuronensystems einhergeht. Beim Distanzieren zeigte sich sowohl auf neuronaler als auch auf subjektiver Ebene kein Zusammenhang mit Empathie. Personen mit höherer Trait-Empathie zeigten bei der Verringerung der sozialen Distanz, eine erhöhte Aktivierung in empathie- und emotionsregulationsrelevanten Gehirnregionen (z. B. vmPFC). Diese Ergebnisse geben Hinweise darauf, dass interindividuelle Unterschiede im Empathieerleben mit einer veränderten Gehirnaktivierung bei Reaktion auf aversives Bildmaterial sowie der Verringerung der sozialen Distanz zusammenhängen. Dies betrifft insbesondere Gehirnareale, die eine zentrale Rolle bei Empathie und/oder Emotionsregulation spielen.

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NOTIZEN:

## Emotionsregulation bei Rettungsdienstmitarbeitern des DRK: ein Vulnerabilitäts- oder Resilienzfaktor?

Gärtner, Anne<sup>1</sup>; Behnke, Alexander<sup>2</sup>; Conrad, Daniela<sup>3</sup>; Kolassa, Iris-Tatjana<sup>2</sup>; Rojas, Roberto<sup>4</sup>

<sup>1</sup>Differentielle und Persönlichkeitspsychologie, Technische Universität Dresden; <sup>2</sup>Abteilung Klinische und Biologische Psychologie, Universität Ulm; <sup>3</sup>Abteilung Klinische und Neuropsychologie, Universität Konstanz; <sup>4</sup>Psychotherapeutische Hochschulambulanz, Universität Ulm

Rettungsdienstmitarbeiter sind häufig psychischem und emotionalem Stress ausgesetzt und werden mit traumatischen Ereignissen konfrontiert. Die Fähigkeit mit negativen Emotionen umzugehen ist daher eine entscheidende Komponente im alltäglichen Berufsleben. Bisher ist jedoch unklar, inwiefern diese einen Prädiktor für das psychische und physische Wohlbefinden von Rettungsdienstmitarbeitern darstellt. In der aktuellen Studie wurden daher verschiedene Emotionsregulationsstrategien auf ihren Einfluss auf subjektives Stressempfinden und psychopathologische Symptome untersucht. Dazu absolvierten  $N=102$  Rettungsdienstmitarbeiter des DRK eine Fragebogenbatterie mit Skalen zur Erfassung von *Rumination*, *Unterdrückung*, *Vermeidung* bzw. *Umbewertung*, *Akzeptanz* und *Problemlösen* (maladaptive bzw. adaptive Emotionsregulationsstrategien). Des Weiteren wurden subjektives Stressempfinden, arbeitsbedingte Stressoren (z.B. Einsatzerlebnisse), ungünstige Arbeitsbedingungen (z.B. Nachtschicht) sowie depressive, posttraumatische und somatische Symptome (= Symptomload) erfasst. Die Ergebnisse linearer Strukturgleichungsmodelle zeigten, dass insbesondere *Rumination* und *Unterdrückung* den subjektiv erlebten Stress und Symptomload verstärkten, während Vermeidung mit weniger subjektiv erlebten Stress einherging. Der Einfluss adaptiver Emotionsregulationsstrategien war eher gering bis gar nicht vorhanden. Die Befunde deuten darauf hin, dass maladaptive Emotionsregulationsstrategien – vor allem *Rumination* und *Unterdrückung* – einen Vulnerabilitätsfaktor für die psychische und physische Gesundheit von Rettungsdienstmitarbeitern darstellen und daher vorrangig von Präventions- und Interventionsmaßnahmen aufgegriffen werden sollten.

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NOTIZEN:

## **Cortisoleffekte auf die neuronalen Korrelate der kognitiven Emotionsregulation**

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

Die Fähigkeit Emotionen zu regulieren ist insbesondere in stresshaften Kontexten eine wichtige Voraussetzung für angemessenes emotionales Erleben und adäquate psychosoziale Interaktionen. Experimentelle Studien zeigen jedoch, dass Stress präfrontale Kontrollfunktionen beeinträchtigt und somit wahrscheinlich auch zu emotionsregulatorischen Defiziten führt. Andererseits wurde das Stresshormon Cortisol aber auch mit stimmungspuffernden Effekten und verbesserten Emotionsregulationsfähigkeiten in Verbindung gebracht. In dieser funktionellen Magnetresonanztomographie-Studie wurde untersucht, wie sich Cortisol auf die neuronalen Korrelate der kognitiven Emotionsregulation auswirkt. Hierzu wurden 64 gesunde Männer und Frauen 90 Minuten nach der pharmakologischen Gabe von Cortisol oder Placebo in einem bilderbasierten Emotionsregulationsparadigma getestet, bei dem emotionale Reaktionen auf negative Bilder anhand verschiedener Strategien (Neubewertung und Ablenkung) herunterreguliert werden sollten. Auf neuronaler Ebene führte Cortisol zu einer gesteigerten regulatorischen Aktivität im ventrolateralen präfrontalen Cortex und abgeschwächten emotionsassoziierten Aktivierungen in der Amygdala und Insula. Darüber hinaus verminderte Cortisol generell das subjektive Erleben negativer Emotionen bei Männern, was mit einer erhöhten Aktivität im dorsomedialen präfrontalen Cortex einherging. Bei Frauen zeigte sich hingegen eine Aktivitätsreduktion in dieser Hirnregion unter Cortisol im Vergleich zum Placebo. Diese Ergebnisse liefern erste Hinweise dafür, dass Cortisol die neuronalen Mechanismen der kognitiven Emotionsregulation begünstigt, indem es die regulatorische Aktivität präfrontaler Areale stärkt und Aktivität in emotionsgenerierenden Arealen reduziert. Diese Glucocorticoid-vermittelten Effekte könnten letztendlich dazu beitragen, emotionale Stabilität in Folge einer akuten Stressphase wieder herzustellen. Die geschlechtsspezifischen Cortisol-Effekte deuten darüber hinaus auf ein komplexes Zusammenspiel zwischen Stresshormonen, Geschlecht und Emotionsregulationsprozessen hin, die sich möglicherweise in unterschiedlichen Vulnerabilitäten und Entwicklungsverläufen affektiver und stressassoziiertes Psychopathologien bei Männern und Frauen widerspiegeln.

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NOTIZEN:

### 1.3.3 Posterblitz [Hörsaal A3]

#### **The Effect of Choice and Embarrassment on the Behavioral and Autonomic Correlates of Deception**

Suchotzki, Kristina; Gamer, Matthias

University of Würzburg, Deutschland

Previous research investigating deception has often used relatively neutral questions and instructed participants when to lie and when to tell the truth. Studies using more emotional or embarrassing questions and/or giving participants the choice to decide themselves when to tell the truth and when to lie are scarce and their results inconsistent. In the current study (n=47) we aimed to investigate the impact of those two practically relevant factors on the behavioral (i.e., reaction times) and autonomic (i.e., skin conductance responses and heart rate changes) correlates of deception. To that means, we used a Sheffield Lie Test, in which participants were either instructed by a color cue when to lie and when to tell the truth or could decide freely. We used both relatively neutral questions (e.g., “Have you ever been to the cinema?”) as well as more embarrassing ones (e.g., “Did you ever fake an orgasm?”). Results replicated previously found longer reaction times and stronger skin conductance responses for lying compared to truth telling. Those differences were, however, only present in the condition in which deception was instructed and not when deception was freely chosen. Effects were less clear in the heart rate changes. No interaction of question type with deception was observed. Those results are interesting as they implicate crucial differences between instructed and freely chosen deception, with the latter being more ecologically valid yet at the same time leading to a disappearance of typically observed behavioral and physiological differences between lying and truth telling.

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NOTIZEN:

**A fast track to the neocortex: long-term memory representations in the parietal cortex**

Brodts, Svenja<sup>1,2</sup>; Gais, Steffen<sup>1</sup>; Erb, Michael<sup>2</sup>; Beck, Jonas<sup>1</sup>; Scheffler, Klaus<sup>2</sup>; Schönauer, Monika<sup>1,2</sup>

<sup>1</sup>Institute of Medical Psychology and Behavioral Neurobiology, University of Tübingen, Germany; <sup>2</sup>MPI for Biological Cybernetics, Tübingen, Germany

Traditional models of systems memory consolidation postulate two interacting memory stores, with rapid encoding of new information supported by the hippocampus and a gradually developing, stable storage in neocortical circuits. Recently, the posterior parietal cortex (PPC), particularly the precuneus, has been proposed as a cardinal location of neocortical long-term memory. We have shown functional activity in this area over repeated learning that is memory specific, long-term stable and related to memory accuracy. To conclusively identify the PPC as a location of memory storage, learning-contingent, lasting structural changes have to be demonstrated as well.

Here, we used diffusion MRI to assess changes in brain microstructure, which reflect neuronal plasticity. 41 participants learned object-place associations over 8 learning-recall repetitions in two sessions. Task-related activity was tracked with fMRI. Structural changes were assessed with dMRI at three time points (before, 90 minutes and 13 h after learning). A non-learning condition measured at the same times was employed as control.

Functional PPC activity increases with learning repetitions, remains stable over a 13-h period and strongly correlates with recall performance. Furthermore, decreases in mean diffusivity indicate structural changes in the same area, which also develop after learning, remain stable for over 12 hours and correlate with behavioral performance.

We thus show functional and structural changes in the PPC that fulfill all requirements for a neocortical long-term memory representation: learning specificity, long-term stability and behavioral relevance. The confirmation of structural plasticity in particular proves the importance of the PPC as a site of neocortical memory storage.

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NOTIZEN:

**Impact of 3-day combined atDCS -visuospatial training on object-location memory in older subjects with and without memory impairment**

Vieira Cavalcanti de Sousa, Angelica<sup>1</sup>; Külzow, Nadine<sup>1,2</sup>; Flöel, Agnes<sup>1,3</sup>

<sup>1</sup>Department of Neurology and Neurocure Cluster of Excellence, Charité Universitätsmedizin Berlin, Germany; <sup>2</sup>Clinical Research Unit, Berlin Institute of Health, Berlin, Germany; <sup>3</sup>Department of Neurology, University Medicine Greifswald, Greifswald, Germany

Mild Cognitive Impairment (MCI) refer to a transitional stage between normal aging and Alzheimer's disease (AD). Notably, object-location memory (OLM) is one of the earliest function to be affected. Given that the transition can take years and that major brain pathology is already present in AD, early therapeutic approaches with the aim to beneficially influence function and possibly also the disease process during preclinical phase receive increasing attention. Here, we combined two neuroplasticity-enhancing approaches: cognitive training and anodal transcranial direct current stimulation (atDCS). In a single-blind cross-over design 14 MCI patients and 32 healthy elderly individuals (HE) underwent a 3-day visuospatial (OLM) training paired with either 20min or 30s (sham) atDCS (1mA, right temporoparietal cortex). Mixed Model analyses were performed to investigate impact on immediate (training success) and longer-term memory (1-month). While no effects were found for longer-term memory, atDCS significantly improved training success of MCI, up to the level of HE. In HE, however, no difference between atDCS and sham was obtained. Further post-hoc analysis determining within- and between-session (on vs. offline) effects across training days indicating that MCI benefited from atDCS "online" but not "offline" contrary to HE. Our findings demonstrate that a combined intervention can improve OLM in MCI. Moreover, the data suggests differential mechanisms of action in MCI vs HE. These encouraging findings should now be followed up with larger cohorts.

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NOTIZEN:

**Age-related decreases in the retrieval practice effect directly relate to changes in alpha-beta oscillations**Guran, C.-N. Alexandrina<sup>1</sup>; Herweg, Nora A.<sup>2</sup>; Bunzeck, Nico<sup>1</sup><sup>1</sup>Universität zu Lübeck, Deutschland; <sup>2</sup>University of Pennsylvania

The retrieval (or testing) of information leads to better memory performance as compared to re-encoding. This phenomenon is known as ‘testing effect’ or ‘retrieval practice effect’ and has been described in several studies using various stimulus material. The underlying neural mechanisms, however, remain unclear. To address this issue, we used a previously established paradigm in healthy young (N = 27) and elderly (N = 28) participants while their brain activity was being recorded using electroencephalography (EEG). Subjects viewed pre-familiarized scene images intermixed with new scenes and classified them as indoor vs outdoor (encoding task) or old vs new (retrieval task). Subsequently, subjects performed a final recognition memory task. As expected, both young and elderly showed the testing effect but it was less pronounced in the elderly. At the neural level, the retrieval task was, as compared to the encoding task, accompanied by power decreases in the alpha (8-12 Hz) and beta bands (13-20 Hz), and this difference was more pronounced in the elderly. In line with this observation, those elderly who displayed a more pronounced testing effect exhibited a neural pattern that was more similar to the younger subjects. Our findings provide further evidence that the testing effect decreases across the life span, and they suggest that changes in alpha-beta oscillations play a direct role.

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NOTIZEN

**Dissociation of ventral and dorsal cortico-striatal networks in patients with OCD suggests targets for therapeutic change**

Balzus, Luisa<sup>1,2</sup>; Kaufmann, Christian<sup>2</sup>; Grützmann, Rosa<sup>2</sup>; Klawohn, Julia<sup>2</sup>; Riesel, Anja<sup>2</sup>; Heinzl, Stephan<sup>3</sup>; Bey, Katharina<sup>4</sup>; Lennertz, Leonard<sup>4</sup>; Wagner, Michael<sup>4</sup>; Kathmann, Norbert<sup>2</sup>

<sup>1</sup>Berlin School of Mind and Brain; <sup>2</sup>Humboldt-Universität zu Berlin; <sup>3</sup>Freie Universität Berlin; <sup>4</sup>University of Bonn

**Introduction:** Overactive performance monitoring, as indicated by an enhanced error-related electrophysiological potential, is considered as a central mechanism in obsessive-compulsive disorder (OCD). In a previous study, we observed (post hoc) that during error processing, patients with OCD (N = 22) showed hyperactivity in dorsal cognitive regions and less relative deactivation in ventral affective regions compared to matched healthy controls (N = 22). We aimed to replicate these findings with an independent and larger sample and to characterize functional connectivity of ventral and dorsal cortico-striatal networks.

**Method:** Functional magnetic resonance imaging (fMRI) data were collected from 81 patients with OCD and 81 matched healthy controls during a flanker task. Hemodynamic responses following errors and functional connectivity were compared between groups.

**Results:** Patients with OCD exhibited increased error-related activation in dorsal cognitive regions, including the lateral prefrontal and parietal cortex, while showing reduced relative deactivation in ventral affective regions, including the orbitofrontal cortex (OFC), medial prefrontal cortex (mPFC), and insula. Connectivity within the ventral affective network, specifically between amygdala and mPFC, and thalamus and OFC, was increased in patients. Unlike control subjects, patients exhibited no increase in coupling within the dorsal cognitive network, specifically between the basal ganglia, lateral prefrontal cortex, and parietal cortex.

**Discussion:** These alterations point to enhanced recruitment of cognitive control, possibly as a compensatory mechanism for enhanced affective processing during performance monitoring in OCD. From a clinical perspective, networks engaged in error processing might be potential targets for future treatment approaches, such as neuromodulatory techniques or cognitive training.

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NOTIZEN:



**Acute psychosocial stress and everyday moral decision-making in young healthy men: The impact of cortisol**

Singer, Nina<sup>1</sup>; Sommer, Monika<sup>2</sup>; Döhnel, Katrin<sup>2</sup>; Zänkert, Sandra<sup>1</sup>; Wüst, Stefan<sup>1</sup>; Kudielka, Brigitte M.<sup>1</sup>

<sup>1</sup>Department of Medical Psychology, Psychological Diagnostics and Research Methodology, University of Regensburg, Universitätsstrasse 31, 93053 Regensburg, Germany; <sup>2</sup>Department of Psychiatry and Psychotherapy, University of Regensburg, Universitätsstrasse 84, 93053 Regensburg

In everyday life, moral decisions must frequently be made under acute stress. Although there is increasing evidence that both stress and cortisol affect moral judgment and behavior as well as decision-making in various domains unrelated to morality, surprisingly few attempts have been made to explore the effects of stress on everyday moral decision-making. Therefore, in the present study, we exposed 50 young healthy men to the Trier Social Stress Test (TSST) or its non-stressful placebo version (PTSST). We investigated the impact of acute stress exposure and stress-related cortisol levels on decision-making, decision certainty, and emotions in 28 everyday moral conflict situations with altruistic versus egoistic response alternatives. Results showed that the TSST-exposed group made more altruistic decisions than the non-stress control group, while groups did not differ in decision certainty and emotion ratings. Moreover, in correlational as well as regression analyses, additionally controlling for confounding variables, we observed significant positive associations between cortisol levels and altruistic decision-making. Further analyses revealed that altruistic decisions came along with significantly higher decision certainty and significantly more positive emotion ratings than egoistic decisions. Notably, our data also raise the idea that the personality trait agreeableness plays an important role in everyday moral decision-making. In sum, our findings provide initial evidence that both acute stress exposure and cortisol levels have prosocial effects on everyday moral decision-making in young healthy men.

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NOTIZEN:

**Induction of unilateral neglect-like behaviour in healthy subjects:  
Exploring ambulatory assessment techniques.**

Ronoh, Erick K.; García Alanis, José C.; Taentzer, Gabriele; Peper, Martin

Philipps-Universität Marburg, Deutschland

Patients suffering from unilateral neglect encounter several problems while performing daily life activities (e.g., navigating through the environment), which may be elicited by inattention to contralesional space or poor multi-modal sensory transformation. Here, we tested the applicability of new ambulatory assessment technology to detect experimentally induced neglect-like behaviours in the field. We implemented a self-developed mobile phone application to assess deviations from walking trajectories in 20 healthy participants. Orientation and deviation from directional movement were measured using the phone's 3-axis accelerometer and gyroscope sensors, which tracked rotational velocity and changes in orientation during movement. Results indicate that phasic and tonic neglect-like movement deviations could be induced by making participants wear prismatic goggles or by means of visual distraction. We discuss how smartphone applications can help assess neglect-like behaviours (e.g., deviation from walking trajectory) in a real-life environment. Further, we provide initial empirical evidence that could help optimise clinical assessment of neglect symptoms in patients' daily life. In addition, we discuss how the feedback mechanisms (i.e. verbal, tone or vibrational mode) could be implemented in the mobile application and be applied to alleviate and improve patients' awareness to the contralesional space.

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NOTIZEN

**Resting frontal asymmetry and personality traits: A meta-analysis**

Kuper, Niclas; Gärtner, Wiebke; Wacker, Jan

Universität Hamburg, Deutschland

Frontal EEG asymmetry has been widely used as a marker of emotion, motivation and psychopathology. Current models of frontal asymmetry conceptualize it as an index for motivational direction - either as a state or as a stable personality trait. The present meta-analysis seeks to provide a comprehensive quantitative review of the relationship between personality traits and frontal asymmetry measured in the resting state. We distinguished five personality clusters based on the reported data: extraversion, neuroticism, impulsivity, anger, and defensiveness. Data from 79 independent studies with overall almost 6000 participants was included in the meta-analysis. The results indicated very small yet significant effects for both extraversion and neuroticism in the expected direction. Less than 1% of the variance in extraversion and neuroticism could be explained by resting frontal asymmetry. Similarly, a small but slightly larger effect was observed for trait anger. No significant effect emerged for impulsivity. A small to medium sized effect was observed for defensiveness, with the smallest number of studies in this cluster. The effects were further reduced after adjustment for publication bias. Given substantial heterogeneity in several main analyses, moderator analyses including both methodological as well as conceptual predictors are presented. We conclude that the validity of resting frontal asymmetry as a marker for personality is not supported. This is discussed with respect to the current replication crisis in psychology. Future research should focus on state frontal asymmetry measured in situations relevant to particular personality traits consistent with a conceptualization of traits as dispositions.

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NOTIZEN

## **Funktionelle Dyskonnektivität des dorsalen Nucleus Caudatus: Assoziation mit der Symptomatik von Schizophrenie**

Weiß, Franziska; Fungisai Gerchen, Martin; Bähner, Florian; Schweiger, Janina; Tost, Heike; Meyer-Lindenberg, Andreas; Kirsch, Peter

Zentralinstitut für Seelische Gesundheit Mannheim, Universität Heidelberg, Deutschland

Schizophrenie ist eine der schwerwiegendsten neuropsychiatrischen Erkrankungen. Sie zeichnet sich durch Symptome wie Wahnvorstellungen, Halluzinationen oder desorganisierte Sprache aus und trägt erheblich zur globalen Krankheitslast bei. Neuartige neurowissenschaftliche Behandlungsansätze versuchen die der Störung zu Grunde liegende Reduktion neuronaler Konnektivität zu verändern, zum Beispiel mittels funktionellem Echtzeit-Magnetresonanztomographie-Neurofeedback. Für die Entwicklung solcher Behandlungsansätze ist zunächst eine Charakterisierung von pathologischen Netzwerkveränderungen nötig. In einem Vergleich der fMRT-Ruhemessungen von ersterkrankten, unmedizierten schizophrenen Patienten und gesunden Verwandten ersten Grades mit gesunden Kontrollen fanden Fornito et al. (2013, JAMA Psychiatry) eine krankheitsassoziierte verminderte Konnektivität des Striatums, insbesondere des dorsalen Nucleus Caudatus (dNC) mit dem linken dorsolateralen präfrontalen Kortex (DLPFC). Ziel unserer Studie war es zu überprüfen, ob sich dieser Befund auch in einer Gruppe von ebenfalls ersterkrankten aber bereits stabil medizierten Patienten (N=19) replizieren lässt. Dazu verglichen wir die funktionelle Konnektivität des dNC dieser Patienten mit einer geschlechtsgematchten Gruppe gesunder Kontrollen (N=19). Anschließend wurde innerhalb der schizophrenen Patienten überprüft, ob die Konnektivität des dNC mit der Positiv- und Negativ-Syndrom-Skala (PANSS) korreliert. Während sich beide Gruppen in ihrer dNC-Konnektivität nicht signifikant voneinander unterschieden, zeigten sich innerhalb der schizophrenen Patienten signifikante Zusammenhänge der Konnektivität des dNC mit dem Broca-Areal, dem anterioren cingulären Kortex und der rechten anterioren Insula mit den PANSS-Skalen ( $p < 0.05$  cluster-level corr.) und insbesondere eine Assoziation der Negativsymptomatik mit verringerter dNC-Konnektivität mit dem rechten DLPFC ( $p = .025$ , peak-level FWE corr.). Während wir die Ergebnisse von Fornito et al. (2013) nicht direkt replizieren konnten, so liefern diese Ergebnisse weitere Hinweise auf Zusammenhänge des dNC-DLPFC-Netzwerks mit der Symptomatik der Schizophrenie.

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NOTIZEN:

**Wanderlust – travelling and stationary sleep oscillations**

Himmer, Lea; Schönauer, Monika; Bürger, Zoé; Maschke, Janina; Wagner, Lore; Braun, Christoph; Gais, Steffen

Eberhard Karls Universität Tübingen, Deutschland

Slow waves and sleep spindles represent exclusive hallmarks of the sleeping brain's activity. Various conflicting theories about their physiology and emergence across the cortex exist. Here, we aim to elucidate their patterns of distribution and their spatio-temporal propagation across the brain.

We acquired high-density 268-channel MEG with additional EEG polysomnography of 10 participants. Each participant spent four 6-h nights in the MEG, enabling us to compare nights within and across participants. Slow waves and sleep spindles were automatically detected and clustered into contiguous events across sensors using a nearest-neighbour algorithm.

The distribution of slow-wave events across the head showed a large diversity in their characteristics both in the temporal (stationary vs. travelling) and in the spatial domain (local vs. global). Travelling waves wandered for up to  $\sim 2$ s, covering distances of up to  $\sim 40$ cm. Slow waves originated uniformly from locations across the entire head surface and showed little preferred travel directions.

Sleep spindles also showed travelling properties, but to a lesser extent (up to  $\sim 1$ s and  $\sim 15$ cm). They had a more local appearance, but could occur in multiple synchronous but distinct bursts. Spindles often originated simultaneously in distant, analogous bilateral regions. Spindles were preferentially detected in clusters of central and occipital-parietal sensors.

The higher spatial resolution of MEG in combination with advanced clustering techniques revealed some unexpected characteristics of sleep oscillations, in particular their local origination and the spatial distinctness of simultaneous events. The distinct characteristics of slow waves and spindles imply divergent physiology and might also point to functional differences.

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NOTIZEN

### 1.3.4 Understanding the neurobiology of social-emotional impairments in mental disorders [Hörsaal A4]

Daniela Mier, Stefanie Lis

Zentralinstitut für Seelische Gesundheit, Mannheim

Impaired social-emotional processing is presented in most of the mental disorders and results in reduced social functioning. However, the mechanisms that result in these impairments are often poorly understood. In this symposium, we present evidence on markers of social and emotional dysfunctioning in autism, depression, schizophrenia and Borderline Personality Disorder.

By using functional magnetic resonance imaging, evidence is found for deficits in basic processing of social stimuli (Daniela Mier and Dana Schneider), as well as during complex social behavior and emotion regulation (Stefanie Lis and Leonie Löffler). The presented studies use healthy samples that vary in the self-reported symptoms of mental disorders (Daniela Mier and Dana Schneider), as well as patient populations (Stefanie Lis and Leonie Löffler). Daniela Mier shows that aberrant brain functioning in response to neutral facial expressions is a candidate for an intermediate phenotype of schizophrenia. Dana Schneider's results suggest changes in early affective processing of social stimuli in participants with high autism scores. Leonie Löffler reports that changes in brain activation overlap in depression for cognition and emotion regulation. Stefanie Lis gives evidence for altered brain activation during social behavior in Borderline Personality Disorder.

Using biological methods gives insight into the mechanisms that lead to the social-emotional deficits in mental disorders. It shows that separating basic and higher order social-emotional processing is necessary for our understanding of mental disorders.

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NOTIZEN:

## **Enhanced activity and connectivity of right posterior superior temporal sulcus in response to neutral facial expressions presents an intermediate phenotype of schizophrenia**

Mier, Daniela<sup>1</sup>; Yan, Zhimin<sup>1</sup>; Schmidt, Stefanie<sup>1</sup>; Hass, Joachim<sup>1,2</sup>; Kirsch, Peter<sup>1</sup> ,

<sup>1</sup>Zentralinstitut für Seelische Gesundheit, Deutschland; <sup>2</sup>SRH Heidelberg

Patients with schizophrenia suffer from severe social-cognitive impairments. Since social cognition is also affected in relatives of schizophrenia patients, deficient social cognition has been proposed as intermediate phenotype of schizophrenia. Recent studies however, suggest that especially the response to neutral facial expressions is altered in schizophrenia accompanied by enhanced activity and connectivity of right posterior superior temporal sulcus (STS). The present study was conducted to investigate whether aberrant STS-functioning in response to neutral faces can be replicated in healthy participants varying in schizotypal traits.

74 healthy participants participated in an event-related social-cognitive functional magnetic resonance imaging task that assessed Theory of Mind, emotion recognition and neutral face processing. Participants also completed the schizotypal personality questionnaire.

Only for neutral face processing, positive correlations between activation in right STS and disorganization, as well as positive pathology were revealed. In addition, connectivity between right and left STS during neutral face processing was positively related to disorganization.

Our findings in healthy participants varying in schizotypy are in agreement with the reported aberrations in response to neutral facial expressions in patients with schizophrenia. The pattern of enhanced activity and connectivity of the right STS during neutral face processing might present the neural intermediate phenotype of social-cognitive deficits in schizophrenia and may cause proneness for the faulty perception of emotions and intentions.

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NOTIZEN:

**Differentiating early and late electrophysiological markers of empathy in individuals with high and low autistic traits**

Schneider, Dana<sup>1</sup>; Wunderlich, Stefanie<sup>1</sup>; Schweinberger, Stefan R.<sup>1</sup>; Dobel, Christian<sup>2</sup>; Zäske, Romi<sup>1,2</sup>

<sup>1</sup>Institute of Psychology, Friedrich Schiller University of Jena, Jena, Germany; <sup>2</sup>Department of Experimental Otorhinolaryngology, Jena University Hospital, Jena, Germany

It has been argued that late cognitive, but not early affective, empathic processes are impaired in individuals with high versus low autistic traits (Fan et al., 2014). We aimed to replicate and extend this finding to person images of various valences and social complexities. Two groups of neurotypical individuals scoring either high or low on the autism spectrum questionnaire (AQ; Baron-Cohen et al., 2001) passively watched scenes from the international affective picture system (IAPS, Lang et al., 2008) and the multifaceted empathy test (MET-core-2, Dziobek et al., 2008) displaying various valences (unpleasant, neutral vs. pleasant) and social complexities (solo vs. interactive scenes). The early posterior negativity (EPN) was increased in the high compared to the low AQ group independent of image valence (200-300 ms). In parallel, the high AQ group also reported more personal distress on a personality questionnaire (Paulus, 2009). Furthermore, the late positive potential (LPP) over midline electrodes was increased for emotional-interactive, but not emotional-solo scenes (370-470 ms) in the high versus low AQ group. This was accompanied by lower reported empathic concern in the high AQ group. Contrary to current findings in the literature, the present data suggest indeed higher sensitivity of individuals with high autistic traits when it comes to early affective empathic processing. This in turn may trigger increased experiences of personal distress, which may hinder later more distant cognitive empathic processing, like empathic concern, especially for socially complex affective scenes.

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NOTIZEN:



## **Cognitive control of attention and its emotion-specific association with cognitive emotion regulation in depression**

Löffler, Leonie<sup>1</sup>; Satterthwaite, Theodore<sup>2</sup>; Habel, Ute<sup>1</sup>; Schneider, Frank<sup>1</sup>; Radke, Sina<sup>1</sup>; Derntl, Birgit<sup>3</sup>

<sup>1</sup>Department of Psychiatry, Psychotherapy and Psychosomatics, Medical Faculty, RWTH Aachen, Aachen, Germany; <sup>2</sup>Neuropsychiatry Division, Department of Psychiatry, Perelman School of Medicine, University of Pennsylvania, Philadelphia, Pennsylvania, USA; <sup>3</sup>Department of Psychiatry and Psychotherapy, Medical School, University of Tübingen, Tübingen, Germany

**Background:** Individuals with major depression show impaired control of attention and emotions. Both processes are conceptually similar and might share common mechanisms. **Aims:** To examine cognitive control of attention and its association with cognitive emotion regulation.

**Method:** 26 patients with a history of major depression (MDD) and 26 healthy controls (HC) performed an emotional face-word Stroop task and an emotion regulation task during fMRI. **Results:** Patients and controls show a similar behavioral performance in both tasks. Across groups, participants who were less distracted from happy faces by the incongruent word “sadness” (Stroop task) were better at regulating their happiness (emotion regulation task). Notably, both the Stroop and emotion regulation tasks recruited the left supramarginal gyrus. Additionally, only MDD showed an attentional disengagement from positive compared to negative stimuli in the Stroop task.

**Conclusion:** Attentional and emotional capabilities appear to be linked at both the behavioral and neural level. Shared mechanisms suggest that emotional disturbances in depression may be improved by interventions that target attentional control, particularly regarding the processing of positive stimuli.

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NOTIZEN:

**Social interaction behaviour in Borderline Personality Disorders: Effects of being included and rejected by others on altruistic and strategic fairness**

Lis, Stefanie; Bungert, Melanie; Koppe, Georgia; Liebke, Lisa; Bohus, Martin

ZI Mannheim, Deutschland

Introduction: A reduced sense of belonging and anxious expectations of being rejected characterize patients with Borderline Personality Disorders (BPD). In a diary study, feeling rejected has been linked to reactive aggression in BPD, a behaviour that may exaggerate interpersonal problems. So far, there are no experimental studies that replicated these findings. To fill this gap, we investigated how the experience of social inclusion and exclusion affects subsequent behaviour in BPD.

Method: Sixty females (30 BPD, 30 healthy controls (HC)) participated in an fMRI study. They played a virtual ball tossing game (cyberball) with two different teams of two co-players. One team included the participant, while the other excluded the participant. Afterwards, all participants played a dictator game and an ultimatum with the virtual players of the cyberball as co-players.

Results: Participants offered less monetary units to excluders than to includers. They increased their offers towards excluders during the ultimatum compared with the dictator game. Towards includers, BPD patients' offers were higher compared with HC. Brain activations differed between groups depending on the offer and anxious expectations of being rejected.

Discussion: Interaction behavior was differentially modulated by a preceding experience of inclusion and exclusion in BPD and HC. Nevertheless, BPD patients are able to adjust their behavior to previous interpersonal experiences and changing social rules. We could not confirm a link between antisocial behavior and a preceding experience of being rejected in BPD. However, refraining from punishing excluders was associated to a stronger engagement of brain regions linked to cognitive control.

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NOTIZEN:

### 1.3.5 Virtual Reality in der Biologischen Psychologie: Grundlagen und klinische Anwendung [Hörsaal A5]

Sina Radke,  
Uniklinik RWTH Aachen

Die Methode der Virtuellen Realität bietet die Möglichkeit realitätsnaher Erfahrungen bei vollständiger experimenteller Kontrolle. Mittels Head Mounted Displays oder Cave Automatic Virtual Environments können komplexe, dynamische und interaktive drei- und vierdimensionale Stimuli präsentiert werden, was deren Einsatz in der psychologischen Forschung attraktiv macht. Dieses Symposium schlägt eine Brücke zwischen grundlagenorientierten Studien und klinischen Ansätzen und stellt in fünf Vorträgen neue Befunde vor. Zunächst legt Benjamin Schöne dar, inwiefern sich die Emotionsinduktion in virtuellen Umgebungen hinsichtlich Verhaltens- und peripherphysiologischer Parameter von der herkömmlichen Emotionsinduktion in 2D unterscheidet. Sina Radke berichtet darüber, wie sich der sog. Personal Space, also der Abstand der zu anderen Personen gehalten wird, in einer virtuellen Umgebung gestaltet und welche Einflussfaktoren hierbei eine Rolle spielen. Im Anschluss erläutert Johannes Fuß den Einsatz der Virtuellen Realität zur Verhaltensphänotypisierung anhand des humanen Elevated Plus-Maze. Über den Einfluss von Angstsensitivität auf die Diskriminierung zwischen bedrohlichen und sicheren virtuellen Kontexten referiert Marta Andreatta. Abschließend präsentiert Thomas Dresler eine klinische Anwendung der Virtuellen Realität in Form eines Selbstregulationstrainings mittels Neurofeedback für Kinder mit ADHS. In diesem Symposium sollen die vielfältigen Einsatzmöglichkeiten von Virtueller Realität aufgezeigt, aber auch die damit verbundenen möglichen Probleme diskutiert werden.

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NOTIZEN:

**Affectus ex machina: Unterschiede in der Emotionsinduktion zwischen virtueller Realität und herkömmlichen Laborsettings**

Schöne, Benjamin; Elise Leila, Radtke; Thomas, Gruber

Universität Osnabrück, Deutschland

Der Begriff ökologische Validität bezeichnet die empirische Gültigkeit einer Studie; das bedeutet, dass Methoden, Materialien und Aufbau den Bedingungen in realen Alltagssituationen entsprechen müssen. Eine Erhöhung der ökologischen Validität vermindert dabei fast zwangsläufig die experimentelle Kontrolle einer Studie. Virtual Reality (VR) könnte dieses Problem lösen, da es die Möglichkeit bietet, unter kontrollierten Laborbedingungen in reale Erfahrungen einzutauchen. Von diesen methodischen Fortschritten könnte besonders die Emotionsforschung profitieren, da frühere Studien gezeigt haben, dass das Präsenzgefühl in einer Szene die emotionale Reaktion verstärkt. Dies wirft die Frage auf, ob Ergebnisse herkömmlicher 2D-Paradigmen auf die reale Welt übertragen werden können. Wir haben affektive Reaktionen mittels eines Videoparadigmas untersucht. Dabei wurden die Teilnehmer mit einem konventionellen 2D- oder einem immersiven 3D360°-VR-Video konfrontiert, das mit einer stereoskopischen Auflösung von 4k bei 60fps gefilmt wurde. Das Material aus unserem Labor deckt ein breites Spektrum von affektiven Szenarien ab, wie z.B. eine Notaufnahme, Landschaften oder Begegnungen mit (gefährlichen) Tieren. Vorläufige Ergebnisse zeigen, dass der selbstberichtete Affekt und die Herzfrequenz mit Grad der Immersion variieren. Das Erleben einer immersiven VR-Situation erzeugt insbesondere bei räumlicher Nähe von möglichen Bedrohungen ein realitätsnahes Gefühl von Präsenz. Der Verlust von räumlicher Distanz zum Stimulusmaterial, welche normalerweise unter Laborbedingungen erhalten bleibt, führt zu lebensnaher Emotionsinduktion und damit einhergehenden Regulationsstrategien. Insgesamt deutet unsere Studie darauf hin, dass die Ergebnisse aus Affekt- und Emotionsinduktionsstudien, die mithilfe von Bild- oder Videoparadigmen gewonnen wurden, nicht ohne weiteres auf Alltagssituationen übertragen werden können. Entsprechende Grundannahmen der psychologischen Forschung sind somit möglicherweise nicht aufrechtzuerhalten.

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NOTIZEN:

**Three's a Crowd: Personal Space in der Virtuellen Realität**

Radke, Sina<sup>1</sup>; Bönsch, Andrea<sup>2</sup>; Overath, Heiko<sup>2</sup>; Asché, Laura<sup>1</sup>; Wendt, Jonathan<sup>2</sup>; Vierjahn, Tom<sup>2</sup>; Habel, Ute<sup>1</sup>; Kuhlen, Torsten<sup>2</sup>

<sup>1</sup>Uniklinik RWTH Aachen, Deutschland; <sup>2</sup>RWTH Aachen, Deutschland

Der Abstand, den eine Person zu ihren Mitmenschen hält, der Personal Space, wird in Abhängigkeit verschiedener persönlicher und sozialer Faktoren dynamisch reguliert. In der vorliegenden Studie wurde der Personal Space zu Virtuellen Agenten in einer immersiven virtuellen Umgebung, der aixCAVE, implementiert. Als Einflussfaktoren wurden hier neben verschiedenen emotionalen Gesichtsausdrücken (freundlich vs. wütend) auch die Anzahl der sich annähernden Personen (einzeln vs. in Dreiergruppen) untersucht. Mit dem sog. Stop-Distance-Paradigma gaben 27 männliche Probanden an, wann bei der Annäherung der Virtuellen Agenten ihr Wohlfühlabstand erreicht wurde bzw. wann diese Grenze überschritten wurde. Insgesamt wurden einzelne Personen näher herangelassen als Dreiergruppen. Ferner wurde zu einzelnen Virtuellen Agenten ein größerer Abstand präferiert, wenn diese wütend statt freundlich schauten. Auch die elliptische Form des Personal Space konnte in der Virtuellen Realität verifiziert werden, sodass diese Ergebnisse die Grundlage für weitere Untersuchungen des nonverbalen Verhaltens in sozialen Interaktionen bieten.

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NOTIZEN:

## **Virtual Reality als Brücke zwischen Verhaltensforschung und Neurowissenschaft**

Fuß, Johannes; Biedermann, Daniel G.; Wenzlaff, Frederike; Kurjak, Tim; Nouri, Sawis; Auer, Matthias K.; Wiedemann, Klaus; Briken, Peer; Haaker, Jan; Lonsdorf, Tina B.; Biedermann, Sarah V.

Universitätsklinikum Hamburg-Eppendorf, Deutschland

Der Einsatz von virtuellen Realitäten ermöglicht neue Ansätze in der psychiatrischen und Verhaltensforschung. Mithilfe von Virtual Reality können Menschen in simulierte Situationen versetzt werden, in denen ihr authentisches Verhalten gemessen wird. Dies ermöglicht eine Phänotypisierung anhand echter Verhaltensparameter anstelle von Selbstauskunft mittels Fragebögen. Der erste Labortest, der authentisches Angstverhalten in einer standardisierten, virtuellen Umgebung misst, ist der von uns entwickelte humane *Elevated Plus Maze* (EPM). Dieser, vom EPM in Tierstudien inspirierte Test, provoziert einen Annäherungs-Vermeidungs (Approach-Avoidance) Konflikt. Die subjektive Angst der Probanden spiegelt sich in physiologischen, endokrinen und Verhaltensparametern wieder. Das Verhalten der Probanden im Test lässt sich durch Angst-verstärkende und -lindernde Medikation beeinflussen.

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NOTIZEN:

## Der Einfluss von Angstsensitivität auf die Generalisierung konditionierter Angstreaktionen

Andreatta, Marta<sup>1</sup>; Neueder, Dorothea<sup>1</sup>; Genheimer, Hannah<sup>1</sup>; Wieser, Matthias<sup>1,2</sup>; Pauli, Paul<sup>1</sup>

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Angstsensitivität ist ein Risikofaktor für die Entstehung von Angststörungen. Hoch ängstliche Individuen beispielsweise assoziieren einen Kontext, in dem eine Gefährdung möglich, aber nicht vorhersehbar ist, sehr schnell mit Gefahr und empfinden in diesem Kontext verstärkt Angst. Eine noch offene Forschungsfrage ist, ob und wie Ängstlichkeit die Generalisierung der konditionierten Angst beeinflusst. Aus diesem Grund durchliefen 62 Probanden ein Kontextkonditionierungsparadigma in virtueller Realität. In zwei Konditionierungsphasen wurden in einem Büroraum (Gefahrkontext, CTX+) unvorhersehbare, leicht schmerzhaft elektrische Reize (unkonditionierter Stimulus, US) appliziert, aber nie in einem zweiten Raum (Sicherheitskontext, CTX-). Während der Testphase wurden die Probanden zusätzlich zu CTX+ und CTX- durch drei Räume geführt, die dem CTX+ bzw. CTX- unterschiedlich stark ähnelten: Ein Raum entsprach dem CTX+ zu 75% (G75-CTX), ein weiterer zu 50% (G50-CTX) und der Dritte zu 25% (G25-CTX). Alle Probanden zeigten eine erfolgreiche Konditionierung, indem sie den CTX+ als negativer, erregender und angstausslösender als den CTX- bewerteten und stärkere physiologische Erregung (skin conductance level, SCL) zeigten. Ein Generalisierungsgradient war ersichtlich, da sich die Angstreaktionen (Ratings und SCL) allmählich von CTX+ über G75, G50, G25 bis zu CTX- reduzierten. Interessanterweise beeinflusste Angstsensitivität die Generalisierung, d.h. je ängstlicher die Probanden waren, desto besser konnten sie den Sicherheitskontext von den G-CTXs diskriminieren. Dieser Befund legt nahe, dass Ängstlichkeit die Diskriminierungsprozesse zwischen (möglichen) bedrohlichen und sicheren Kontexten verbessert.

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NOTIZEN:

## Neurofeedback für Kinder mit ADHS – Selbstregulationstraining in einem virtuellen Klassenraum

Dresler, Thomas<sup>1,2</sup>; Blume, Friederike<sup>2,3</sup>; Hudak, Justin<sup>1,2</sup>; Kühnhausen, Jan<sup>2,3</sup>; Renner, Tobias J.<sup>4</sup>; Ehli, Ann-Christine<sup>1</sup>; Gawrilow, Caterina<sup>2,3</sup>

<sup>1</sup>Department of Psychiatry and Psychotherapy, University Hospital, Tübingen;

<sup>2</sup>LEAD Graduate School & Research Network, Eberhard Karls Universität, Tübingen;

<sup>3</sup>Department of Psychology, Eberhard Karls Universität, Tübingen;

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Die Aufmerksamkeitsdefizit-/Hyperaktivitätsstörung (ADHS) ist durch Symptome der Unaufmerksamkeit, der Hyperaktivität und der Impulsivität charakterisiert. Diese Kernsymptome sind mit Veränderungen in neurophysiologischen Prozessen assoziiert. Im Rahmen von Neurofeedbacktrainings werden eine verbesserte Selbstregulation dieser neurophysiologischen Prozesse und dadurch eine Reduktion der Symptomatik angestrebt. Damit zusammenhängende funktionelle Beeinträchtigungen, die beispielsweise das Verhalten in sozialen und Bildungskontexten beeinträchtigen, sollten gleichsam reduziert werden. Jedoch weisen aktuelle Metaanalysen darauf hin, dass die Wirksamkeit solcher Trainings nicht sonderlich hoch ist. Insbesondere der Transfer der erworbenen Regulationsfähigkeiten aus dem Labor bzw. der Praxis in den Alltag scheint schwierig zu sein. Deshalb sollte zukünftige Studien zu Neurofeedbacktrainings insbesondere auf eine Verbesserung der Wirksamkeit und des Transfers abzielen.

Die Implementierung eines Neurofeedbacktrainings in einen virtuellen Klassenraum könnte beidem zuträglich sein. Erstens kann das Training in einer virtuellen Realität aktuellen Studien nach die Motivation erhöhen; dies sollte sich auf die Wirksamkeit auswirken. Zweitens ist anzunehmen, dass die physiologischen und psychologischen Reaktionen ähnlich wie im wahren Leben ausfallen. Dies sollte in einer intensiveren „realen“ Lernerfahrung münden, was sich ebenfalls positiv auf die Wirksamkeit auswirken sollte. Drittens ist durch die Ähnlichkeit von Lern- und Schulkontext ein leichter Abruf des Gelernten zu erwarten; dies sollte einen besseren Transfer ermöglichen.

In diesem Vortrag wird das Studiendesign eines Neurofeedbacktrainings in einem virtuellen Klassenzimmer für Kinder mit ADHS mit ersten Ergebnissen vorgestellt und zukünftige Entwicklungen diskutiert.

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NOTIZEN:



## 1.4 Postersession I; 16:45-18:15 [Foyer]

### **01** Preferential neuronal processing of chemosensory anger signals in men and women

Storch, Dunja; Lübke, Katrin T.; Pause, Bettina M.

Heinrich-Heine-Universität Düsseldorf, Deutschland

Humans communicate anxiety via chemosensory signals. First hints indicate that anger is communicated similarly. The current study is the first to examine whether event-related potentials (ERP) in response to anger sweat indicate the presence of an effective chemosensory signal.

Axillary sweat was collected via cotton pads from 17 men and 17 women participating in a competitive, frustrating computer game (anger condition) and while playing a construction computer game (control condition). Donors reported a stronger increase of anger during frustration compared to the control condition ( $p < .001$ ). Sweat samples were pooled with reference to donor gender and condition, and presented to 23 men and 25 women (0.4 seconds, ISI: 18.5-22.5 s) with constant flow (100 ml/s). Ongoing EEG was recorded from 61 scalp locations, and chemosensory ERPs (N1, P3-1) were analyzed. P3-1 amplitudes were larger in response to male anger compared to male control sweat ( $p = .009$ ). Moreover, P3-1 amplitudes were larger in response to male compared to female anger sweat ( $p = .009$ ), especially in women ( $p = .017$ ). Women also showed larger P3-1 ( $p = .019$ ) and N1 ( $p = .043$ ) amplitudes for male compared to female sweat in general.

The enlarged P3-1 in response to male anger sweat indicates pronounced evaluative processing, in line with the presence of an important signal. Women seem to be especially sensitive to male chemosensory signals (N1, P3-1). As angry men might be a source of potential danger, the current results suggest that male anger sweat contains an important alarm signal.

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NOTIZEN:

**02 The influence of state anxiety/fear on endogenous pain inhibition (CPM)**

Metzger, Silvia; Lautenbacher, Stefan

Universität Bamberg, Deutschland

Background: Conditioned pain modulation (CPM), a method to assess endogenous pain inhibition, is defined as attenuated response to noxious stimuli (“test stimuli”, TS) during application of a second noxious stimulus (“conditioning stimulus”, CS) as compared to a baseline (TS presented alone). Although state anxiety/fear influence pain perception (anxiety increases pain sensitivity and fear decreases it), the impact of these emotions on CPM has not yet been studied.

Aims: We aimed at clarifying if state anxiety/fear have divergent effects on CPM. We expected that CPM-effect is reduced by state anxiety but not altered by state fear. Methods: We used the NPU paradigm to induce state anxiety/fear by the application of unpredictable and predictable electric shocks. A hot water bath (46°C) was used as CS, heat pulses (contact thermode, 49°C, applied at inner forearm) as TS. Subjects rated painfulness of TS alone and during application of CS in three conditions (anxiety, fear, control). Furthermore, heat-evoked potentials (N2-P2) triggered by TS were compared between baseline and while CS was applied (in all conditions).

Results: Results revealed a CPM-effect in N2-P2 amplitudes, but not in pain ratings. There were no differences in CPM-effect in N2-P2 amplitudes between the conditions (anxiety, fear, control).

Conclusion: Our study showed that state anxiety/fear did not influence CPM-effect. Implications: This was the first study to investigate the influence of state anxiety/fear on CPM. Further studies should clarify mediating effects of anxiety-related personality traits on CPM in dependence of anxiety and fear.

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NOTIZEN:

**03 Sustained tuning to a fear-conditioned stimulus in the human visual cortex 24 h after successful extinction**

Antov, Martin I.<sup>1</sup>; Plog, Elena<sup>1</sup>; Bierwirth, Philipp<sup>1</sup>; Keil, Andreas<sup>2</sup>; Stockhorst, Ursula<sup>1</sup>

<sup>1</sup>Universität Osnabrück, Deutschland; <sup>2</sup>University of Florida, Gainesville (FL), USA

Previous work with steady-state visually evoked potentials (ssVEP) shows that cells in the visual cortex change their selective tuning to stimulus orientation during fear conditioning: Processing of a stimulus orientation (CS+) reliably predicting an aversive noise (US) is selectively enhanced in lower-tier visual cortex, while processing of similar non-paired orientations (CS-) is inhibited. In immediate extinction, the tuning curve adapts to the changed contingency with evidence for active inhibition of the CS+ orientation. However, extinction forms a new memory trace which is itself subject to consolidation.

Our goal was to replicate earlier findings and examine for the first time consolidation of extinction in the visual cortex. In 20 healthy men, we used ssVEPs evoked by Gabor gratings with 7 orientations, presented in a phase-reversing stream at 14 or 15 Hz. In acquisition, one grating (CS+) was paired with an aversive 98 dB noise (US), while 6 were not (CS-). In habituation, extinction training, and extinction memory test (24 h later) no US occurred. Each CS was presented 16 times per learning phase.

Our results replicate previous findings for acquisition and immediate extinction. Importantly, we found sustained changes in visual tuning over the centro-parietal cortex 24 h after extinction, taking the shape of lateral inhibition. This tuning was present far longer (13 trials) than a brief return-of-fear measured in skin conductance responses (2 trials). This shows how associative learning dynamically biases sensory tuning to relevant feature dimensions and suggests that some of the resulting sensory bias may be resistant to extinction.

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NOTIZEN:

**04 Do glucocorticoids and noradrenergic arousal induce fear over-generalization?**

Kausche, Franziska M.<sup>1</sup>; Zerbes, Gundula<sup>1</sup>; Onat, Selim<sup>2</sup>; Müller, Jana Christina<sup>3</sup>; Wiedemann, Klaus<sup>3</sup>; Büchel, Christian<sup>2</sup>; Schwabe, Lars<sup>1</sup>

<sup>1</sup>University of Hamburg, Department of Cognitive Psychology, Germany; <sup>2</sup>Institute for Systems Neuroscience, University Medical Center Hamburg-Eppendorf, Germany; <sup>3</sup>Department of Neurology, University Medical Center Hamburg-Eppendorf, Germany

Fear learning, especially the phenomenon of fear (over)generalization is - thought to play a key role in the development and maintenance of anxiety disorders. It is well known that stress affects learning and memory in many ways but whether and how stress may alter fear generalization is to date largely unknown. Here, we tested the hypothesis that glucocorticoids and noradrenaline, two major stress mediators, promote fear over-generalization. To test this hypothesis, we conducted a two-day fear generalization experiment with a pharmacological manipulation, using hydrocortisone and yohimbine, an  $\alpha$ -2-adrenergic receptor antagonist. On the first day, participants passed a fear acquisition phase, in which a certain stimuli (CS+) was paired with an electric shock (US), whereas another stimuli was never paired with the US (CS-). On the next day, participants came back for the test phase. Critically, before this test phase, participants received orally either a placebo (P), hydrocortisone (H), yohimbine (Y) or both hydrocortisone and yohimbine (HY). During the following test phase, participants saw again the CS+ and CS- along with six similar stimuli, serving as generalization stimuli (GS). Skin conductance response, heart rate, blood pressure, and subjective ratings served as measure for the fear response, hence for the generalization strength. We hypothesized that the HY group would show a stronger fear generalization compared to the other groups. Data analysis is in progress, results will be presented at the meeting.

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NOTIZEN:

**05** Peripheral responses during extinction and generalization following social fear learning in virtual reality – Effect of prior given hand massage

Wagner, Viola; Schedlbauer, Anna; Greenlee, Mark; Mühlberger, Andreas

Universität Regensburg, Deutschland

Previous studies have shown that our operant social fear conditioning (SFC) paradigm could serve as a suitable tool to simulate social fear and its extinction in virtual reality (VR). In parallel, there is the assumption that human touch and tactile stimulation could lead to endogenous oxytocin (OXT) release that is known to affect human behavior and in particular anxiety. In the present study, we aim to investigate the effect of prior human given tactile stimulation on social fear learning and its extinction. We hypothesized that 10-min hand massage before conditioning will lead to reduced social fear conditioning and increased extinction learning in comparison to a control condition. In our study, conditioning and extinction will occur directly following massage or control treatment and a generalization test at the subsequent day. Thirty male participants are going to actively (using a joystick) approach virtual male persons (agents) that serve as conditioned stimuli (CS). During the acquisition phase, an electric pulse stimulation will be presented as unconditioned stimulus (US) for CS+ (75% contingency) and never for CS- agents. During extinction, no US will be delivered, and during generalization, one further agent will be added to test generalization effects. Outcome variables are anxiety ratings, physiological reactions in heart rate (HR) and electrodermal activity (EDA). The study will contribute to knowledge on the mechanisms of development and maintenance of social fear and giving implications for further improvement of treatments for social phobia.

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NOTIZEN:

**06** **17 $\beta$ -estradiol and the role of prefrontal theta and gamma oscillations during fear and extinction recall in humans**Bierwirth, Philipp<sup>1</sup>; Sperl, Matthias<sup>2</sup>; Antov, Martin I.<sup>1</sup>; Stockhorst, Ursula<sup>1</sup><sup>1</sup>Universität Osnabrück, Deutschland; <sup>2</sup>Philipps-Universität Marburg,

Neurophysiological studies suggest a role of neural oscillations in the fear conditioning network: In humans, theta oscillations in the dorsal anterior cingulate cortex (dACC) were associated with fear recall, and gamma oscillations in the ventromedial prefrontal cortex (vmPFC) with extinction recall [1]. First animal studies demonstrate sex differences in these prefrontal oscillations. Interestingly, the female sex hormone 17 $\beta$ -estradiol (E2) is associated with altered fear and extinction recall. However, so far no study examined the association between E2 and prefrontal oscillations. We used a differential fear-conditioning paradigm to assess fear and extinction recall and examined free-cycling women during mid-cycle (high E2, low progesterone [P4]), women using oral contraceptives (low E2, low P4) and men (low E2, low P4). Four pictures of male faces served as conditioned stimuli (CS) and a 95-dB white-noise burst functioned as unconditioned stimulus (US). During fear acquisition two stimuli were paired with the US (CS+), whereas the other two were not (CS-). During subsequent extinction learning, only one CS+/CS- pair was extinguished (CS+E/CS-E). Fear recall (difference: not extinguished CS+N – CS-N) and extinction recall (difference: CS+E – CS-E) took place 24h after fear acquisition. Electroencephalogram (64-channel EEG) was recorded. We used wavelet analysis and standardized low resolution electrotopography (sLORETA) to examine the time-frequency characteristics and source localization of theta and gamma oscillations during fear and extinction recall. Furthermore, CS-related skin conductance responses and subjective ratings were assessed. Results of the ongoing study will be presented.

[1] Mueller E. et al. (2014), J Neurosci., 34, 7059-7066.

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NOTIZEN:

**07** Episodic simulations reveal the structure of affective representations in ventromedial prefrontal cortexPaulus, Philipp C.<sup>1,2</sup>; Charest, Ian<sup>3</sup>; Benoit, Roland G.<sup>1</sup>

<sup>1</sup>Max Planck Research Group - Adaptive Memory, Max Planck Institute for Human Cognitive and Brain Sciences, Leipzig, Germany; <sup>2</sup>International Max Planck Research School on Neuroscience of Communication, Leipzig, Germany; <sup>3</sup>School of Psychology, University of Birmingham, UK

The ventromedial prefrontal cortex (vmPFC) has been associated with mnemonic processing as well as with valuation. Here, we test the hypothesis that this region supports these seemingly disparate functions by representing affective associations of our environment. That is, we suggest that the vmPFC codes for elements from our environment (e.g., for personally familiar people and places) such that the representational geometry of those elements is determined by (i) the relative position of the elements within their network (e.g., how central a person is to an individual's social sphere), (ii) the degree of knowledge about those elements, and (iii) their affective value. To test this hypothesis, participants provided names of personally familiar people and places. They then arranged the names on a two-dimensional surface to indicate how strongly they associate these elements with each other (indexing degrees of centrality). Participants also indicated how familiar they are with each person and each place (indexing degrees of knowledge), and how much they like them (indexing affective value). We then aggregated centrality, familiarity, and liking to estimate the structure of participants' unique affective associative representations. In a following functional MRI session, participants vividly imagined interacting with each person and place, which allowed us to assess each element's neural representation. Using representational similarity analysis, we then examined the representational geometry of these elements. Preliminary analyses support our hypothesis: the structure of the neural representations in the vmPFC indeed seems to reflect the cognitive structure of the estimated affective representations.

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NOTIZEN:

**08 Regionalspezifische Veränderung der Hauttemperatur im Gesicht bei der Betrachtung emotionaler Bilder**

Rebeck, Dagmar<sup>1,2</sup>; Finke, Johannes<sup>1</sup>; Koch, Klaus Peter<sup>2</sup>; Schächinger, Hartmut<sup>1</sup>

<sup>1</sup>Universität Trier, Deutschland; <sup>2</sup>Hochschule Trier, Deutschland

Die Infrarot-Thermografie lässt selbst geringfügige oder kurzfristige Veränderungen der Hauttemperatur im Gesicht über die Zeit erkennen. Die berührungslose Messung der Wärmestrahlung der Haut durch Thermografie kann gleichzeitig mit anderen physiologischen Messungen durchgeführt werden. Die zusätzliche Erfassung und Speicherung der Gesichts- und Umgebungstemperatur mit auf der Haut angebrachten Temperatursensoren sowie die Erfassung der elektrodermalen Aktivität (EDA) an der Stirn dient als Referenzmessung zur Überprüfung des Emissionsgrades. Unter kontrollierten Laborbedingungen wurden den Probanden ( $n = 15$ , davon 8 weiblich) emotionale Bilder präsentiert, aufgeteilt in Blöcken mit jeweils 20 positiven/neutralen und 20 negativen/neutralen Bildern aus dem International Affective Picture System (IAPS) und anderen. Die Bilder waren parallelisiert für Arousal-Ratings. Signifikante Veränderungen des Blutdrucks, der Herzfrequenz und der EDA an der Hand belegen den Erfolg der Intervention. Eine ereigniskorrelierte Analyse der Temperaturveränderung zeigt regionalspezifische Effekte mit unterschiedlicher Zeitdynamik; bei den weiblichen Probanden kommt es im frühen Verlauf an der Stirn bei negativen und positiven Bildern zur Erwärmung (im Unterschied zu den neutralen). Tendenziell unterscheidet sich die Erwärmung der Wange von weiblichen Probanden bei negativen von neutralen und positiven Bildern, bei positiven von den neutralen nicht. Bei den männlichen Probanden ist dieser Effekt nicht zu beobachten. Nase und Wange zeigen nur einen allgemeinen Effekt über die Zeit. Dieser ist in den positiven Blöcken wesentlich stärker als in den negativen und bei den weiblichen Probanden stärker als bei den männlichen. Zusammenfassend finden sich Belege für schnelle differenzielle Effekte emotionaler Verarbeitung auf die Hauttemperatur im Gesicht.

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NOTIZEN:



**09** Stress and sex influence the success of cognitive emotion regulation

Hagedorn, Bianca; Stock, Lisa-Marie; Wolf, Oliver T.; Kinner, Valerie L.

Ruhr-Universität Bochum, Deutschland

Adaptive responding requires successful emotion regulation especially during stressful situations. Stress is commonly believed to impair cognitive emotion regulation. However, a recent study revealed a facilitated downregulation of negative emotions in a subgroup of free-cycling female participants. Thus, the interaction of the factors stress and sex requires further clarification.

In this study, healthy participants (males, free-cycling females and females taking oral contraceptives) underwent either a psychosocial stress paradigm or a non-stressful control condition and were subsequently asked to apply different emotion regulation strategies to up- or downregulate their upcoming emotional responses towards negative pictures. Emotional ratings, skin conductance responses, heart rate variability and pupillary responses were measured to indicate emotional arousal and emotion regulation success. Irrespective of stress, a successful application of emotion regulation strategies was reflected in subjective measures of valence and arousal. Preliminary results further suggest that stress led to lower arousal ratings during the downregulation of negative emotions via reappraisal in male participants. In accordance, stressed participants reported higher emotion regulation success when applying reappraisal as compared to non-stressed controls. However, results concerning physiological parameters dissociated from behavioural measures: stress was generally reflected in decreased heart rate variability, which argues for increased arousal.

In conclusion, the results provide further evidence for the differential impact of stress and sex on emotion regulation processes. Stress seems to enhance the capacity to downregulate negative emotional arousal via reappraisal specifically in men, whereas the reported reappraisal success was generally increased under stress.

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NOTIZEN:

**10 Neuronale Korrelate der Emotionsregulation bei positiven und negativen Geräuschen**

Gerdes, Antje; Alpers, Georg W.

Universität Mannheim, Deutschland

Studien zu Emotionsregulation haben sich bisher primär auf die Regulation von emotionalen Bildern konzentriert. Da aber anzunehmen ist, dass bei emotionalen Ereignissen auch Reize aus anderen Sinnesmodalitäten eine Rolle spielen, sollte in der vorliegenden Studie Emotionsregulation bei emotionalen Geräuschen untersucht werden. Dazu wurden 26 gesunden Versuchspersonen 90 positive und negative Geräusche präsentiert. Während der Präsentation sollten die Versuchspersonen ihre emotionale Reaktion auf die Geräusche mithilfe von Neubewertungsstrategien verstärken, abschwächen oder nicht regulieren. Erfasst wurden Valenz- und Arousalbewertungen, sowie ereigniskorrelierte Potentiale mittels EEG. Die Ergebnisse zeigen, dass emotionale Reaktionen auf die Geräusche erfolgreich reguliert werden können – positive Geräusche werden weniger positiv und weniger aufregend, negative Geräusche weniger negativ und weniger aufregend bewertet, wenn die emotionale Reaktion abgeschwächt werden sollte im Vergleich zu einer Verstärkung. Einflüsse der Regulationsstrategien auf die neuronalen Korrelate zeigen sich vor allem in späten Komponenten der Emotionsverarbeitung (<300ms). Eine geringere Verarbeitung emotionaler Geräusche unter der Regulationsbedingung “Abschwächen” im Vergleich zu den anderen Bedingungen zeigt sich sowohl in einem signifikant geringerem Late Positive Potential (300 – 1000ms), sowie in einer anschließenden geringeren zentralen Positiven Slow Wave. Eine Modulation früher Potentiale konnte nicht gefunden werden. Die vorliegenden Befunde zeigen, dass emotionale Reaktionen bei Geräuschen vergleichbar zu emotionalen Bildern erfolgreich reguliert werden können und sich diese Effekte auch in neuronalen Korrelaten der Emotionsverarbeitung widerspiegeln. Inwiefern die Modulation später Komponenten spezifisch für die Regulation emotionaler Geräusche ist, soll in zukünftigen Studien systematisch untersucht werden.

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NOTIZEN:

**11 Effects of Attentional Focus and Personality on Subjective Affective Experience and Perceived Exertion after Acute Moderate Exercise**

Meixner, Friedrich; Herbert, Cornelia

Ulm University, Germany

Acute moderate exercise seems to have a positive effect on mood in most people. Nevertheless, feelings of exertion and negative mood have also been reported. Thus, interindividual differences and the attentional focus during exercise (e.g., internal/external focus) may be key factors influencing exercise effects. The present study investigated whether personality factors, specifically BIS and BAS and the attentional focus during exercise might be moderating variables for effects of acute exercise on subjective well-being.

15 female participants were investigated in a within-subject repeated-measures design: participants cycled on a stationary ergometer at moderate intensity (60-70% HRmax) for 20 minutes, while their attentional focus (external (EF), internal (IF), no focus (NF)) was experimentally manipulated. A physically inactive control condition was included. Personality variables (e.g. anxiety, BIS/BAS) were assessed via self-report. During the experiment, changes in mood, affect, subjective exercise experience and perceived exertion were recorded at multiple times.

During EF and NF positive affect increased immediately after exercise. The IF did not change positive affect, whereas positive affect declined in the control condition of physical inactivity. BIS was negatively correlated with positive exercise experience during IF. BAS was positively associated with positive exercise experience during and immediately after exercise, but only in the NF or IF condition.

The results suggest that attentional focus during exercise interacts with personality which determines exercise experience and affect during/following acute moderate exercise. Hence, manipulating attentional focus may be a means to optimize exercise experience in individuals varying in BIS and BAS personality traits.

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NOTIZEN:

**12** Attentional preference for angry, fearful or neutral facial expressions and its relationship with psychopathic traitsEisenbarth, Hedwig<sup>1</sup>; Zhang, Jiayue<sup>1</sup>; Kransberg, Jonas<sup>1</sup>; Wieser, Matthias<sup>2</sup><sup>1</sup>University of Southampton, Vereinigtes Königreich; <sup>2</sup>Erasmus University Rotterdam

Psychopathic traits have been linked with reduced preferential processing of threatening cues, such as negative facial expressions. However, facial expressions can have differential social meaning, with threat directed towards the observer (angry facial expression) or towards the depicted person (fearful facial expression). In order to investigate the differential impact of these two conditions on preferential processing, we used steady-state visual evoked potentials (ssVEP) to measure attentional bias for angry vs. fearful vs. neutral facial expressions. Using a median split for psychopathic traits (PPI-R-40), we compared visuocortical activity in response to competing faces in 24 low and 23 high psychopathic students. First analyses averaging across 100-2900ms show main effects for the tagged emotion as well as for the competing emotion. A three-way interaction of tagged emotion, competing emotion and group shows some indication for less intense processing of angry or fearful expressions in high psychopathic participants compared to low psychopathic participants. Furthermore, low psychopathic participants show greater facilitation for angry facial expressions with neutral competing expressions and for fearful facial expressions when neutral or angry facial expressions are competing. Additional analyses for consecutive time windows will allow for to deconstruct the effect over processing time.

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NOTIZEN:

**13** Neuronale Korrelate appetitiver Extinktion

Kruse, Onno<sup>1,2</sup>; Tapia León, Isabell<sup>1,2</sup>; Klein, Sanja<sup>2</sup>; Stark, Rudolf<sup>2</sup>; Klucken, Tim<sup>1</sup>

<sup>1</sup>Universität Siegen, Deutschland; <sup>2</sup>Justus-Liebig-Universität Gießen, Deutschland

Appetitive Extinktion gilt als wichtiges Modell für die Behandlung von psychischen Störungen wie Suchterkrankungen. Die neuronalen Korrelate des Extinktionslernens sind jedoch bislang kaum untersucht. In einer ersten Studie lernten Probanden (n=21 Männer) zunächst, dass nach einem neutralen Reiz (CS+) die Möglichkeit bestand durch schnelle Reaktion auf einen Zielreiz Geld zu gewinnen, während nach einem zweiten neutralen Reiz (CS-) unabhängig von der Reaktionszeit nie Geld gewonnen werden konnte. Einen Tag später fand die Extinktion statt, bei der beide Reize ebenfalls wiederholt präsentiert wurden und keine Möglichkeit eines Geldgewinns bestand. Zur Akquisition und Extinktion wurden fMRT, EDA und subjektive Ratings erfasst. In der frühen Phase der Extinktion zeigte sich Aktivierung des dACC, die mit Ratings des Belohnungsabrufs assoziiert war, und vACC, sowie NAcc und Amygdala in der späten Phase, die mit Ratings des Extinktionslernens assoziiert waren. Zusätzlich werden Ergebnisse einer aktuellen Replikationsstudie in einer zweiten Stichprobe (n=40, 50% Frauen) vorgestellt.

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NOTIZEN:

**14 Keep calm and carry on: Reduced central-parietal positivity and increased resistance to emotional interference in subjects with psychopathic traits during a continuous performance task**

Güth, Malte R.; García Alanis, José C.; Peper, Martin

Philipps-Universität Marburg, Deutschland

Pursuing important goals often demands cognitive function to be maintained and protected against emotional interference. In particular, down-regulation of emotion via reappraisal relies on active, deliberate processing of information, imposing additional load on working memory. Primary psychopathic traits (e.g., fearlessness, social potency) have often been associated with increased resistance to these dual demands. Here, we investigated whether elevated psychopathic traits (PP+) were associated with proactive exertion of cognitive control and increased resistance to emotional interference as compared with low psychopathy (PP-). Extreme groups of non-violent subjects with high or low self-reported trait psychopathy were tested with the Dot-Pattern Expectancy task. During performance, Event-Related Potentials (ERPs) associated with different working memory functions were recorded. After a baseline period, we administered an aversive oral stimulus, which subjects had to emotionally reappraised. Results indicate that PP+ individuals displayed greater reliance on proactive control. During simultaneous emotional reappraisal, PP+ and PP- displayed significantly attenuated ERP amplitudes and slower reaction times, indicative of a diminishing effect of reappraisal on proactive control. This trend was stronger for PP- individuals. Our results, highlight the relatedness of working memory and emotional reappraisal processes and demonstrate a strong effect of dual regulation demands in terms of ERP and behavioural measures. Dual task demands appeared to have pushed PP- individuals towards a more reactive control style, while PP+ individuals appeared to have been successful in maintaining a proactive control strategy. These group differences support the idea of altered cognitive control capabilities being associated with psychopathic traits.

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NOTIZEN

**15** **Testing the usability of a brief momentary stress scale in an ambulatory assessment design**

Zänkert, Sandra; Bärtl, Christoph; Wüst, Stefan

Universität Regensburg, Deutschland

Although several self-report measures for momentary stress experience exist in the literature, none of these seemed to meet the needs of a planned longitudinal ambulatory assessment (AA) study. In this planned study, we intend assessing changes in mood, psychological and physical health during a stressful period over one year. Therefore, we selected 18 items (7-point Likert scale) to form an AA stress scale covering several domains including mood, agitation, self-satisfaction, concern, anxiety and somatic symptoms.

To explore the usability of this AA stress score we recruited 20 healthy students (3 males) for a short two day AA pilot study with a mild everyday stressor (giving a presentation in a university seminar) on the second day. On each day, 10 beeps were triggered either fixed (first assessment in the morning upon awaking between 7 and 9 am and last day assessment in the evening at 9 pm) or quasi-randomly (assessments during the day). Right before and after the presentation, students started assessments via button press. AA stress scores varied between 18 and 83 (maximum range: 18 – 126). An intra-class correlation of .57 documented variability between as well as within participants and the factor day (non-stress vs. mild stress) revealed a significant association with the AA stress score when entered in a multilevel model indicating different experience of stress on both days. Altogether, the presented AA stress scale seems to be a suitable measure to detect changes in self-reported stress in an ambulatory assessment design

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NOTIZEN

**16 Real-life social contact increases emotional well-being, relates to amygdala volume and interacts with early adversity**

Gan, Gabriela<sup>1</sup>; Ma, Ren<sup>1</sup>; Reichert, Markus<sup>1,2</sup>; Urs, Braun<sup>1</sup>; Ebalu, Tracie<sup>1</sup>; Akdeniz, Ceren<sup>1</sup>; Hoell, Andreas<sup>3</sup>; Ebner-Priemer, Ulrich<sup>2</sup>; Tost, Heike<sup>1</sup>; Meyer-Lindenberg, Andreas<sup>1</sup>

<sup>1</sup>Department of Psychiatry and Psychotherapy, Central Institute of Mental Health, Medical Faculty Mannheim/Heidelberg University, Mannheim, Germany; <sup>2</sup>mental mHealth Lab, Department of Sport and Sport Science, Karlsruhe Institute of Technology, Karlsruhe, Germany; <sup>3</sup>Central Institute of Mental Health, Medical Faculty Mannheim/Heidelberg University, Mannheim, Germany

Social support is a protective factor for mental and physical health buffering against the effects of stressful events. Across species, larger social networks relate to increased amygdala volume, a brain area important for social-emotional functioning. Here, we combined smartphone-based ecological momentary assessment (EMA) with structural magnetic resonance imaging (sMRI) to assess the impact of social contact on emotional well-being in real-life (“social emotional gain”) and to explore associations with amygdala volume in healthy adults. Additionally, we investigated interactions with early childhood adversity, a risk factor for social-emotional dysfunction.

Across 7 days, 209 participants (77 males, age: 23 ±3) rated their emotional well-being (well/unwell, satisfied/not satisfied), and reported on social contact (in company vs. alone) using electronic-diaries (9-24 prompts/day). Early childhood adversity was assessed using a brief self-report instrument. Additionally, a subsample (n=103) underwent sMRI. In a random-intercept random-slope multi-level model, well-being was increased during social contact ( $p < .001$ ), indicating social emotional gain. Higher subclinical early childhood adversity was linked to increased social emotional gain ( $p = .03$ ). Voxel-based morphometry showed that individuals with higher social emotional gain have significantly larger amygdala volumes ( $p_{\text{FWE-ROI}} = 0.035/0.042$ ).

Our findings suggest that the propensity to benefit from social contact in real life relates to amygdala structure, which has previously been associated with protective social influences. Our findings further highlight the consequences of even mild forms of early childhood adversity on emotional well-being in adulthood and identify social contact as an important beneficial factor for the emotional well-being of individuals at risk for psychiatric illness.

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NOTIZEN



**17 Human Exploration Behavior in a Virtual Elevated Plus-Maze (EPM) is Influenced by Fear of Heights rather than Trait Anxiety**

Madeira, Octavia; Gromer, Daniel; Pauli, Paul

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The Elevated Plus-Maze (EPM) is a plus-shaped platform with two open and two closed arms and a fundamental behavioral test for anxiety in rodents. Rats and mice instinctively avoid open arm alleys presumably to hide from potential predators when given time to freely explore. However, exploration behavior can be modified by application of either anxiolytic or anxiogenic substances resulting in either increased or reduced time spent on open arms. Currently, research on a human version of the EPM is limited. Therefore, we transferred the EPM adjusted to human proportions into a virtual environment using a five sided CAVE-System. Equivalent to the original animal studies, participants were given the opportunity to freely explore the EPM for five minutes. Additionally, questionnaires to elaborate different levels of acrophobia, claustrophobia and trait anxiety were conducted. Moreover, motion-tracking data were recorded. The results reveal that unlike rodents, humans do not have a specific alley preference. Nevertheless, further analysis identified height anxiety as a crucial influence on exploration behavior i. e. avoidance of open arms but no effect for trait anxiety or claustrophobia was found. Consequently, we assume that in exposing human participants to a virtual EPM different anxiety-related networks are activated and a direct conceptual transfer to a human context is not practical. Future research may focus on more realistic and natural versions of a human plus-maze to extend existing anxiety models for a better understanding of anxiety-related factors.

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NOTIZEN

**18** **Psilocybin induces aberrant prediction error processing for tactile mismatch responses**

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Predictive codes integrating bodily states and sensory inputs may give rise to self-awareness and a sense of agency. Distortions in these processes have been linked to psychiatric symptoms like schizophrenic delusions. However, the relationship between altered tactile prediction error (PE) processing and distorted self-experience and its underlying neuropharmacology have never been empirically studied. Therefore, we investigated the effect of psilocybin (Psi), known to induce alterations in self-experience, on tactile mismatch responses.

In this double-blind, randomized, placebo-controlled study, fifteen healthy participants received 0.2 mg/kg of the 5-HT<sub>2A/1A</sub> agonist Psi. Participants completed a roving oddball task while undergoing functional magnetic resonance imaging.

In response to unpredicted stimuli significant decreases in brain activity in the Psi condition were detected in areas previously implicated in body awareness and tactile deviancy processing: thalamus, somatosensory cortex, and prefrontal areas.

This study shows that Psi alters the integration of tactile stimuli through aberrant PE signalling, potentially the underlying mechanism of Psi-induced alterations of self-experience. Furthermore, it points to the importance of the 5-HT<sub>2A/1A</sub> system in these processes and for the treatment of psychiatric disorders compromised by distorted self-experience.

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NOTIZEN:

**19** How do oral contraception and the female menstrual cycle affect emotional Stroop conflict?

Hornung, Jonas; Stern, Franziska; Noack, Hannes; Kogler, Lydia; Derntl, Birgit

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Recent evidence suggests that hormonal fluctuations occurring e.g. within women due to the natural menstrual cycle or due to the use of oral contraceptives (OCs) have an impact on cognitive and emotional processing. In the present experiment we therefore aimed at addressing the impact of participant sex and hormonal fluctuations on emotional conflict processing.

In a functional magnetic resonance imaging (fMRI), a total of 80 participants were tested (including men, OC-users and luteal women). We used an emotional Stroop task (emoSTROOP) to measure emotional conflict processing. Behavioral results. Intake of oral contraceptives led to generally faster reactions ( $p = .014$ ) and fewer errors ( $p = .025$ ) compared to men but not compared to luteal women ( $p$ 's  $>.14$ ). Luteal women and men did not differ regarding general reaction times and error rates ( $p$ 's  $= 1$ ). However, conflict processing did not differ between our experimental groups ( $p$ 's  $>.12$ ).

fMRI results. Men and women showed general activation differences in visual areas but conflict processing did not differ across our groups. This was true for both whole-brain and more specific region of interest analyses including areas like fusiform gyrus and amygdala.

Our findings indicate that overall healthy men and women show no differences in conflict processing as measured by an emotional Stroop task. This was true both for behavior and regarding the neural correlates of conflict processing. This provides initial evidence that conflict processing is quite robust across healthy student participants and does not seem to be afflicted by hormonal changes or hormonal differences.

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NOTIZEN:

**20** **Respiratory modulation of startle: effects on subjective intensity and psychomotor response times**

Münch, Eva Elisabeth<sup>1</sup>; Vögele, Claus<sup>1</sup>; Van Diest, Ilse<sup>2</sup>; Schulz, André<sup>1</sup>

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Respiratory cycle time modulates reflexive startle eye blink responses to acoustic stimuli. Responsible for this effect seems to be the afferent input of slow adapting pulmonary stretch receptors. It remains unclear, however, whether this respiratory modulation of startle (RMS) effect is also reflected in the modulation of higher cognitive, evaluative processing of the startle stimulus. Twenty-nine healthy volunteers received 80 acoustic startle stimuli (100 or 105 dB(A); 50 ms; binaural; instantaneous rise time), which were presented during peak and ongoing inspiration and expiration, while performing a paced breathing task at 0.25 Hz. Participants first responded to the startle probes by ‘as fast as possible’ button pushes and then rated the perceived intensity of the acoustic stimuli. Psychomotor response time was divided into pre-motor (from stimulus onset to home button release; represents stimulus evaluation) and motor response time (from home button release to target button press). Intensity judgements were higher and evaluative response times accelerated during on-going expiration. No effect of respiratory cycle phase was found on eye blink responses and motor response time. We conclude, therefore, that respiratory cycle phase affects higher cognitive, attentional processing of acoustic startle stimuli.

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NOTIZEN:

**21** **Error monitoring under threat: Electrocortical correlates of learning reward contingencies**

Schellhaas, Sabine; Paret, Christian; Schmahl, Christian; Bublatzky, Florian

Zentralinstitut für Seelische Gesundheit, Deutschland

Efficient error processing is crucial for adaptive behavior. However, the impact of learning reward contingencies under threat is not well understood. The present study examined the influence of verbally instructed threat-of-shock on error monitoring and the underlying neuronal mechanisms. To this end, electrocortical indicators of error processing were investigated (i.e. feedback-related negativity [FRN] and late positivity [P3]). Thirty participants chose between two stimuli contingent with either monetary gains or losses, receiving both congruent and incongruent feedback. After reaching a probabilistic learning criterion reward contingency was reversed. Two contextual background colors were instructed to signal threat of electric shocks or safety. Self-report data confirmed that stimuli presented in a threatening context were perceived as more unpleasant, arousing, and threatening. Behavioral performance (error rates and reaction times) did not vary between the threatening and safe context. In line with the overall assumption that threat accelerates error detection, participants made less errors during threat compared to safety until reaching the learning criterion. FRN was increased by incongruent loss and congruent win but not congruent loss feedback. The amplitude of P3 was increased following loss but not win feedback. Thus, FRN was more affected by feedback expectations, P3 by feedback valence. Moreover, threat effects were observed for the FRN but not for the P3 component, with a more pronounced FRN under threat. This indicates that threat increases early feedback-related error detection mechanisms both on the behavioral and neuronal level. These findings are discussed in terms of error sensitivity and implications for anxiety disorders.

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NOTIZEN:

**22** **Physiological responding to reward contingencies reversal: Decision making under threat**

Bublitzky, Florian; Schellhaas, Sabine; Borchert, Ann-Marie; Schmahl, Christian; Paret, Christian

Zentralinstitut für Seelische Gesundheit, Deutschland

Predicting the consequences of one's own decision is crucial to organize adequate future behavior. When reward contingencies vary, however, the flexible adjustment of decisions may be impaired by concurrent stressful and threatening conditions. The present study tested the impact of verbally instructed threat-of-shock on choice behavior in a probabilistic decision making task. To this end, 35 participants had to choose between two options which were either contingent with monetary gains or losses. Behavioral options were differently reinforced and reward contingencies were reversed after reaching a probabilistic threshold of 6-9 correct choices. Decision making and reversal learning was tested with two contextual background colors which were instructed as signals for threat of electric shocks (e.g., blue) or safety (e.g., green). As a manipulation check, self-report data confirmed that threat relative to safety condition was perceived as more unpleasant, arousing, and threatening. Moreover, indicating enhanced autonomic arousal during threat compared to safety, skin conductance responses were more pronounced following congruent win but not loss feedback. Overall, behavioral performance was comparable during threat or safety condition (reaction times and error rates). Regarding reversal learning, however, participants made more errors during threat compared to safety condition. Thus, when anticipating aversive events, more mistakes were needed until participants successfully re-adjusted to profitable choice behavior. These findings are discussed in terms of operant reversal learning mechanisms with implications for emotion dysregulation and anxiety disorders.

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NOTIZEN:

**23** Assoziationen der DNA-Methylierung des Serotonintransporter-Gens mit der Regulation der Hypothalamus - Hypophysen - Nebennierenrinden-Achse im Alltag: Eine Momentary-Assessment-Studie.

Stoffel, Martin; Aguilar-Raab, Corina; Rahn, Stefanie; Moessner, Markus; Ditzen, Beate

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Einleitung. Die Dysregulation der Hypothalamus-Hypophysen-Nebennierenrinden-Achse (HPA-Achse) ist ein wichtiger Faktor bei der Entstehung von stressassoziierten psychiatrischen Erkrankungen. Ein Korrelat ebendieser sind genetische Variationen und epigenetische Regulationsprozesse des Serotonintransporter-Gens (SLC6A4). Die vorliegende Studie untersucht die Assoziationen genetischer und epigenetischer Parameter von SLC6A4 mit Stressempfinden und der HPA-Achsen-Regulation im Alltag.

Methode. N = 75 (Alter (M  $\pm$  SD): 21.39  $\pm$  3.04 Jahre; 49 Frauen) Studierende der Medizin gaben an insgesamt vier Tagen in deren Alltag sechs Speichelproben pro Tag zur Bestimmung der zirkadianen Rhythmik von Cortisol ab und füllten pro Messzeitpunkt jeweils einen Kurzfragebogen aus. Der Polymorphismus 5-HTTLPR und die SLC6A4-Methylierung, in einem promoter-assoziierten Bereich mit insgesamt 15 CpGs, wurden aus Blutproben bestimmt.

Ergebnisse. Die Analysen mit Mehrebenen-Modellen ergaben, dass eine höhere mittlere Methylierung mit geringeren Cortisol-Konzentrationen im Tagesverlauf ( $\beta = -0.0588$ ,  $p = .0105$ ) sowie einem geringeren Gesamtoutput von Cortisol pro Tag (AUCg;  $\beta = -0.1942$ ,  $p = .0211$ ) assoziiert war. Ferner zeigte eine Interaktion von 5-HTTLPR und mittlerer Methylierung ( $\beta = -1.3675$ ,  $p = .0085$ ) negative Assoziationen von Methylierung und Stressempfinden im Alltag bei Trägern zweier S-Allele.

Diskussion. Die Ergebnisse legen nahe, dass die Methylierung von SLC6A4 mit der Regulation basaler neuroendokriner Prozesse bei gesunden Probanden in deren Alltag assoziiert ist. Ferner kann vermutet werden, dass Veränderungen in der SLC6A4-Methylierung, abhängig von 5-HTTLPR, für eine höhere dispositionelle Stresssensitivität der Träger zweier S-Allele kompensieren.

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NOTIZEN:

**24** **Gaze cueing in naturalistic scenes under top-down modulation  
- A conceptual replication**

Großekathöfer, Jonas David; Suchotzki, Kristina; Gamer, Matthias

Julius-Maximilian Universität Würzburg, Deutschland

Humans as social beings rely on information provided by conspecifics. One important signal in social communication is eye gaze. The current study (n=93) sought to replicate and extend previous findings of attentional guidance by eye gaze in complex everyday scenes. In line with previous studies, longer, more and earlier fixations for objects cued by gaze were observed in free viewing conditions. To investigate how robust this prioritization is against top-down modulation, half of the participants receive a memory task that required scanning the whole scene instead of exclusively focusing on cued objects. Interestingly, similar gaze cueing effects occurred in this group. Moreover, the human beings depicted in the scene received a large amount of attention even though they were irrelevant to the current task. These results indicate that the mere presence of other human beings as well as their gaze orientation have a strong impact on attentional exploration.

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NOTIZEN:



**25** Shorter telomere length is associated with increased activation in the anterior cingulate cortex and hippocampus in response to a psychosocial stressor

Ferri, Jamie; Müller-Alcazar, Anett; Dedovic, Katarina; Pruessner, Jens; Canli, Turhan

MSH Medical School Hamburg, Deutschland

Exposure to chronic stress and individual differences in the perception of stressful experiences have been associated with shorter telomere length. Individual differences in the function of stress-related neural circuitry might be one mechanism linking shorter telomere length to stress exposure and reactivity. In this study, we examined neural activation during an acute psychosocial stressor and its relationship to telomere length in a sample of 31 psychologically healthy male participants. Shorter telomere length was associated with stress-related increases in anterior cingulate cortex and hippocampal activation, two key regions implicated in stress reactivity. These findings suggest that increases in stress-related neural reactivity, even to relatively mild stressors in healthy populations, may be one potential mechanism linking individual differences in the experience of common stressors to differences in telomere length. Furthermore, hyperactivation of the anterior cingulate cortex may be one mechanism linking greater endocrine and autonomic response to increased biological aging as indexed by shorter telomere length.

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NOTIZEN:

**26** Stress-induced heart rate reactions to ScanSTRESS: A comparison to the Trier Social Stress Test (TSST)

Henze, Gina-Isabelle; Spannruff, Katharina.; Konzok, Julian; Landfried, Elias; Schleicher, Daniel; Kudielka, Brigitte M.; Wüst, Stefan

Institute of Experimental Psychology, University of Regensburg, Germany

In the present study, 76 healthy subjects (40 females) were exposed to ScanSTRESS, a neuroimaging stress paradigm that prompts the subject to perform arithmetic and rotation tasks while being monitored by an investigator panel. Consistent with the Trier Social Stress Test (TSST), this paradigm particularly aims at inducing uncontrollability and social-evaluative threat. The paradigm is presented in a block design in two runs with alternating stress and control blocks. During fMRI scanning, heart rate (HR) recordings were obtained with a MRI compatible finger oximeter. HR levels increased in both runs (run 1:  $F(3.14, 235.55) = 34.30$ ,  $p \leq .001$ ; run 2:  $F(2.56, 181.79) = 48.20$ ,  $p \leq .001$ ) with higher levels in stress than in control blocks ( $t(68) = 9.27$ ,  $p \leq .001$ ). Mean HR in stress blocks were not significantly different between runs, while control block HR in the second run were on average 2.40 bpm lower than in the first run ( $t(72) = 2.35$ ,  $p = .022$ ).

Subsequently, we compared the present ScanSTRESS HR responses with TSST HR responses in a previous cohort consisting of 192 healthy subjects (107 females). Mean pre-stress HR were only moderately different although subjects are lying during ScanSTRESS but standing during TSST exposure (ScanSTRESS: 84.22, TSST: 87.67 bpm). Subsequent heart rate increases were significantly larger in response to the TSST ( $t(267) = 2.74$ ,  $p = .007$ ). The present analysis documents robust heart rate responses to ScanSTRESS exposure. Response differences between ScanSTRESS and TSST can probably be explained by different temporal and psychological characteristics of the two paradigms.

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NOTIZEN:

**27** Does overtraining promote habitual responding in humans?

Cremer, Anna; Schwabe, Lars

Universität Hamburg, Deutschland

Habits are automatically triggered, stimulus-driven behaviors that are insensitive to their consequences. As such, they can be distinguished from goal-directed actions. While newly acquired actions are goal-directed and sensitive to changes in outcome value, research in animals has shown that continued invariant training promotes habitual behavior. Although it is typically taken for granted that extensive training induces habitual responding also in humans, so far only one study has demonstrated this effect. Recent data, however, did not show any evidence of habits after overtraining. Here, we tested the hypothesis that overtrained instrumental responses are less sensitive to outcome devaluation compared to those that have not been overtrained. Participants learned to earn sweet and salty rewards each of which were associated with a fractal image and a specific key. One group received a brief training, while the other group was trained extensively. After the last training session, either the sweet or the salty reward was devaluated through specific satiety. In the following extinction test, participants were offered to press for the rewards once again. If the habit formation was successful, the stimuli should elicit responding for both valued and devalued cues. The change indices did not differ between the groups as a function of training. Therefore, our results fail to replicate an induction of habits after overtraining. However, our data collection is part of a multi-center investigation, which is currently being analyzed. These pooled results may provide an important contribution to the ongoing discussion about challenges in the experimental induction of habits

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NOTIZEN:

**28 Eine experimentelle Untersuchung der Stressansteckung mit Hilfe des Trier Social Stress Tests**

Erkens, Valerie A.<sup>1</sup>; Nater, Urs M.<sup>2</sup>; Hennig, Jürgen<sup>1</sup>; Häusser, Jan A.<sup>1</sup>

<sup>1</sup>Justus-Liebig-Universität Gießen, Deutschland; <sup>2</sup>Universität Wien

Stressansteckung bezeichnet das Phänomen, eine physiologische und affektive Stressreaktion zu zeigen bzw. zu erleben, wenn eine andere Person in einer stressvollen Situation beobachtet wird, ohne dass der Beobachter selbst in diese involviert ist. Besteht eine geringe soziale Distanz, z.B. eine Partnerschaft oder Eltern-Kind-Beziehung, zwischen dem Beobachter und der gestressten Person, ist Stress mit einer höheren Wahrscheinlichkeit ansteckend. Um den zugrundeliegenden Mechanismus dieser Befunde genauer zu beleuchten, wurde untersucht, ob das Vorliegen einer geteilten sozialen Identität zwischen Beobachter und gestresster Person bei den Beobachtern eine stärkere physiologische und affektive Stressreaktion hervorruft. In Experiment 1 (N = 94) nahmen jeweils vier Probanden und ein Konföderierter pro Erhebung teil. Nachdem entweder eine soziale oder eine personale Identität salient gemacht wurde, beobachteten die Probanden eine vermeintliche Liveübertragung, die den Konföderierten bei der Bewältigung eines sozio-evaluativen Stressors, dem Trier Social Stress Test (TSST), zeigt.

Die Stressreaktion der Probanden wurde zu vier Messzeitpunkten erfasst. Nach Beobachtung des TSST zeigte sich im Vergleich zur Baseline-Messung bei 58% der Probanden ein erhöhter Cortisolspiegel; bei 20% der Probanden ist dieser Anstieg physiologisch signifikant ( $>1,5$  nmol/l). Dieses Ergebnis repliziert bisherige Befunde zur physiologischen Stressansteckung. Zudem berichteten 72% der Probanden ein erhöhtes subjektives Stressempfinden. Entgegen der Erwartungen wurde die Stressansteckung jedoch nicht durch eine geteilte soziale Identität moderiert. In einer derzeit laufenden Follow-up-Studie beobachten die Probanden nach der Manipulation der Identitätssalienz einen zufällig bestimmten anderen Probanden während der Bewältigung des TSSTs in einer face-to-face Situation. Die Ergebnisse beider Studien werden in diesem Vortrag vorgestellt und diskutiert.

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NOTIZEN:

**29 Voice as a marker of psychosocial stress - relationship to physiological and subjective measurements**

Bahr, Lisa-Marie<sup>1,2</sup>; Wechsler, Theresa<sup>1</sup>; Nothdurfter, Caroline<sup>1,2</sup>; Mühlberger, Andreas<sup>1,2</sup>

<sup>1</sup>University of Regensburg, Germany; <sup>2</sup>Neuroscience Graduate Programme GRK 2174, University of Regensburg, Germany

The nonverbal content of speech contains information about a speakers' physiological and psychological state. Analyzing the voice seems promising as an enrichment of existing methods of arousal detection and could thereby serve as a further non-invasive marker of acute psychosocial stress.

In the present study 32 women in the luteal phase of their menstrual cycle are exposed to acute psychosocial stress using the Trier Social Stress Test in virtual reality (VR-TSST) with half of the group inhaling an essential oil. Voice recordings are taken before stress as a baseline measure as well as during the stress test. Heart rate (HR), electrodermal activity (EDA) and measurements of perceived stress are recorded throughout up to 20 minutes after the test.

The vocal profile of the participants will be analysed regarding parameters like fundamental frequency (F0) and intensity. Comparisons will be drawn within subjects as well as between the two experimental groups and correlations to the physiological and subjective measurements will be performed.

The results of this currently ongoing study will be presented and discussed. We expect the voice markers to differentiate between a non-stressed and a stressed state which would mean further progress in the assessment of psychosocial stress. Using voice parameters could be helpful in therapeutic contexts for example when applied within a biofeedback context

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NOTIZEN:

**30** Neurite architecture of the planum temporale predicts neurophysiological processing of auditory speech

Friedrich, Patrick<sup>1</sup>; Ocklenburg, Sebastian<sup>1</sup>; Fraenz, Christoph<sup>1</sup>; Schlüter, Caroline<sup>1</sup>; Beste, Christian<sup>2</sup>; Güntürkün, Onur<sup>1</sup>; Genç, Erhan<sup>1</sup>

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The left-hemispheric advantage in speech perception is reflected in faster neurophysiological processing. Based on post-mortem data, it has been suggested that asymmetries in the organization of the intrinsic microcircuitry of the posterior temporal lobe may produce this leftward timing advantage. However, whether this hypothetical structure-function relationship exists in living human subjects has never been empirically validated.

To test this assumption, we used a diffusion MRI-based method called “neurite orientation dispersion and density imaging” (NODDI) to quantify microcircuitry in terms of axon and dendrite complexity of the left and right planum temporale in 98 individuals. Furthermore, the cortical processing time of auditorily presented consonant-vowel syllables was assessed via event-related potentials in the EEG.

We found that a higher density of dendrites and axons in the left planum temporale is associated with faster neurophysiological processing in the left hemisphere, indicated by shorter N1 latencies.

Our results thus imply that a higher density and number of synaptic contacts in the left posterior temporal lobe increases temporal precision and decreases neurophysiological processing during speech perception.

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NOTIZEN:

**31** Enhancing mindfulness by combining neurofeedback with meditation

Prestel, Marcel; Riedl, Rebecca; Ott, Ulrich

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In meditation, mind-wandering has to be suppressed in order to maintain a state of mindfulness. Mind-wandering has been linked to increased activity in default mode network (DMN) and indeed, meditators show less activity in DMN regions. Since increased activity of the DMN has been associated with mental disorders (e. g. depression), the DMN was even proposed as a biomarker for monitoring therapeutic effects of meditation. We found that frontal mid-line theta (FMT) EEG activity was negatively correlated with BOLD activity in the DMN. In addition, a recent study with expert meditators reported that FMT power was increased during deep meditation and reduced during mind-wandering. Therefore, in order to study possible synergies, FMT power was chosen for neurofeedback, while subjects applied different meditation strategies.

In our experiment, six subjects were introduced to two forms of meditation to be used during neurofeedback training and received FMT-neurofeedback in 8 sessions over the course of two weeks. Individual FMT power was visually fed back on a screen via a light cone that increased in size and brightness when FMT power rose. Each session was followed by an interview for subsequent qualitative analysis. All subjects were able to raise average FMT power over the course of the neurofeedback training, as shown by the correlation between FMT power and training session number (range:  $0.26 < r < 0.82$ , mean:  $r = 0.64$ ). Furthermore, subjective reports indicate an increase in perceived ability to influence the feedback signal by maintaining a state of focused attention.

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NOTIZEN:

**32 Langzeitfolgen einer pränatalen Behandlung mit synthetischen Glukokortikoiden auf die endokrine Stressreaktivität in Kindheit und Jugendalter**

Ilg, Liesa<sup>1</sup>; Rosenlöcher, Franziska<sup>2</sup>; Li, Shu-Chen<sup>1</sup>; Kirschbaum, Clemens<sup>3</sup>; Alexander, Nina<sup>4</sup>

<sup>1</sup>Professur für Entwicklungspsychologie und Neurowissenschaft der Lebensspanne, Fakultät für Psychologie, TU Dresden, Deutschland; <sup>2</sup>Berufsfachschule für Geburtshilfe, Universitätsklinikum Carl Gustav Carus Dresden, Deutschland; <sup>3</sup>Professur für Biopsychologie, Fakultät für Psychologie, TU Dresden, Deutschland; <sup>4</sup>Professur für Differentielle und Persönlichkeitspsychologie, Fakultät für Humanwissenschaften, MSH Medical School Hamburg, Deutschland

Synthetische Steroidhormone, die als Routinebehandlung bei einer drohenden Frühgeburt zur Beschleunigung der Lungenreifung eingesetzt werden, stellen einen potentiellen Einflussfaktor auf die Entwicklung der hormonellen Stressregulation dar. Empirische Studien zur Untersuchung möglicher Auswirkungen beschränken sich dabei hauptsächlich auf einen kurzen Zeitraum nach der Geburt, wobei Frühgeburten als ein wesentlicher konfundierender Faktor gelten. Alexander et al., (2012) konnten erstmalig Hinweise für Langzeitfolgen auf die psychosoziale Stressreaktivität bei reifgeborenen Kindern im Alter von 6 bis 11 Jahren aufzeigen. Bislang liegen jedoch keine Befunde zu Auswirkungen einer pränatalen Glukokortikoid-Gabe auf die weitere neuroendokrine Entwicklung bis ins Jugendalter vor, wobei diese Lebensphase von maßgeblichen Veränderungen der hormonellen Stressaktivität gekennzeichnet ist. Daher wurde im Rahmen der aktuellen Längsschnittstudie eine Teilstichprobe von Alexander et (2012) erneut im Jugendalter (14 - 18 Jahre) untersucht, bestehend aus 22 Probanden, die pränatal mit synthetischen Glukokortikoiden behandelt wurden sowie 22 Kontrollprobanden. Zur Messung der Stressreaktivität wurden Cortisolsekretionsmusters während eines standardisierten psychosozialen Stresstests (Kirschbaum et al., 1993) zu beiden Messzeitpunkten ermittelt. Neben einem allgemeinen Anstieg der Cortisolwerte von der Kindheit ins Jugendalter, zeigten die Ergebnisse signifikant erhöhte Cortisolwerte für Probanden, die pränatal synthetischen Glukokortikoiden ausgesetzt waren im Vergleich zu Kontrollprobanden. Zudem war ein modulierender Effekt der pränatalen Glukokortikoid-Exposition auf die individuelle Stabilität der Stressreaktivität im Entwicklungsverlauf festzustellen. Diese aktuellen Befunde deuten auf eine frühe Programmierung der hormonellen Stressachse durch Glukokortikoide hin mit Langzeitfolgen bis ins



Jugendalter. Derartige Abweichungen der neuroendokrinen Reifung werden als ein potentieller Risikofaktor für die Entwicklung von Stressregulations- und Verhaltensregulationsproblemen diskutiert, die sich häufig im Jugendalter manifestieren.

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NOTIZEN:

**33 Prenatal Programming of Newborn Telomere Length through Maternal Pro-inflammatory State during Pregnancy**

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**Background.** Telomere biology plays a fundamental role in maintaining the integrity of the genome and cell, and shortened telomeres have been linked to several age-related diseases. The initial (newborn) telomere length (TL) represents a critically important aspect of an individual's telomere system across the lifespan. Adverse conditions in intrauterine life such as maternal stress during pregnancy are associated with shorter offspring TL at birth and in adult life. Alterations in stress-related immunological processes during pregnancy constitute a potential mediating biological pathway in this context because they can affect telomere length and telomerase activity via NFB-mediated pathways. Thus, in the present study we tested if the balance between tumor necrosis factor- $\alpha$  (TNF- $\alpha$ ), the major pro-inflammatory cytokine, and interleukin-10 (IL-10), the major anti-inflammatory cytokine, assessed throughout pregnancy, is related to newborn telomere length (TL) at birth.

**Method.** Participants were healthy women (N=108) recruited in early pregnancy. Concentrations of TNF- $\alpha$  and IL-10 were quantified in early, mid and late pregnancy from maternal blood samples. Telomere length was assessed in newborn blood samples within four weeks after birth.

**Results.** After adjusting for maternal age, maternal pre-pregnancy BMI, birth weight, gestational age at birth and infant sex, a higher mean TNF- $\alpha$ /IL-10 ratio during pregnancy was significantly associated with shorter newborn TL (beta=-.208, p=.031).

**Conclusion.** These findings provide new evidence in humans for a potential developmental programming effect by pro-inflammatory processes during pregnancy on the newborn telomere biology.

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NOTIZEN:

**34** Effects of exertion from isometric handgrip task on the human startle reaction.

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Acute stress can be induced by short, physically demanding exercise, such as an isometric handgrip (IHG) task, which has been shown to result in pronounced ANS activation. The human startle reflex is likewise accompanied by concurrent increases in sympathetic nervous system activation. However, the impact of voluntary muscle contraction on startle reactivity remains unknown, even though there is initial evidence for stress-induced modulation of startle reactivity. We collected a sample of 25 young, healthy individuals to investigate the question. The participants started with a short resting phase, then conducted a maximal voluntary strength test. After another resting period, they completed two three-minute IHG with a follow-up resting phase with either the right or the left hand for 10% or 40% of their maximal voluntary strength (counterbalanced between subjects). To investigate laterality effects we presented five different startle stimuli throughout the experiment: one tone habituation noise (white noise, 105 dB, instant rise, 50ms), and four similar tones acting as spatial sound cues, to give an impression of direction (left vs. right). This was done in two tones via interaural level difference (ILD) and for two tones with interaural time difference (ITD). As dependent variables bilateral-EMG of the musculus orbicularis oculi, EKG and galvanic skin response were measured.

The data revealed a significant elevation in heart rate in the difficult (40%) IHG condition, differences between the peak EMG amplitudes between the startle stimuli, and a stronger startle reaction in the intense IHG condition (40% of their maximal voluntary strength).

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NOTIZEN:

**35** Post-learning cold pressor stress, after a heartbeat perception training, enhances interoceptive accuracy in high blood pressure responders

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Interoceptive accuracy (IAc) plays an important role for generation of medically unexplained symptoms (MUS) and trainings to enhance IAc reduces the perceived symptom severity of MUS. Post-learning stress may facilitate recognition learning. It is yet unknown, however, if acute stress, when evoked during the memory consolidation phase, could enhance the visceral learning in a heartbeat perception training (HBPT). The present study is the first to investigate the effects of a socially evaluated cold pressor test (SECPT) induced after a HBPT aimed at increasing IAc. The sample consisted of 48 healthy students (28 women). IAc was assessed at three different time points: (1) once as a baseline measure, (2) 30 minutes after the SECPT, and (3) the day after. Assessment of IAc was performed using the heartbeat perception task developed by Schandry (1981). The HBPT followed the baseline IAc assessment and was a replication of the paradigm developed by Schaefer et al. (2014). The SECPT followed immediately after the HBPT. Results showed that post-encoding stress significantly increased IAc between T1 and T3 for participants showing a high blood pressure (BP) response in the SECPT compared to the control group, whereas low BP responders did not show such an effect. This indicates that post-encoding stress enhances visceral memory consolidation in high BP responders compared to low BP responder and non-stressed control participants. Post-learning stress facilitation of visceral learning and memory may represent a mechanism underlying symptom generation, which should be addressed in studies on somatic symptom disorders in the future.

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NOTIZEN:

**36** **The Ups and Downs of Attentional Filtering in Early Visual Processing**

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We previously reported evidence that the earliest component (C1) of the visual evoked potential in humans may be affected by attentional load. However, this effect was only observed in the upper visual field. Here, we investigated this apparent anisotropy. Participants first performed a mapping session to identify texture stimuli whose spatial frequency would elicit maximal C1 responses in different parts of the visual field. In a second session, individually selected texture stimuli were used as irrelevant distractors while subjects performed low-load (single-feature detection) vs. high-load (feature-conjunction detection) fixation tasks in different experimental blocks. As expected, individual pre-selection of texture stimuli unmasked the effect of attentional load that went undetected in our previous experiment. At the same time, however, pre-selection of texture stimuli eliminated effects of attentional load in the upper visual field. This suggests that attentional filtering itself is asymmetric with regard to spatial-frequency anisotropies across the visual field.

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NOTIZEN:

**37** **Attentional fingerprints: Individual differences in gaze behavior**

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Recent findings in twin children suggest a heritable component for fixation behaviour towards social and complex scenes. However, the nature of these differences and their persistence into adulthood are largely unclear.

Here, we present results of an experiment tracking the gaze of 52 adults freely viewing 700 complex scenes. We harnessed semantic annotations for >5,500 objects to probe the magnitude and consistency of individual differences in semantic salience.

Observers showed large and surprisingly consistent differences in the average number of objects they fixated and in their average dwell time per object (split half reliability for both  $r=.99$ ). We further investigated the proportion of fixations towards objects from different semantic categories. This revealed considerable and highly consistent individual differences in semantic saliency for most tested stimulus categories. Similar was true for an analysis considering only the first fixation, landing on each image, investigating ‘saliency’ in a stricter sense.

Our findings suggest that gaze behaviour is marked by attentional ‘fingerprints’: highly individual tendencies for visual exploration and for fixations along dimensions of semantic saliency. This opens a new window of opportunity for the study of attentional selection and suggests a potential link between individual differences in perception, personality and behaviour.

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NOTIZEN:

**38** **Avoidance Habits under stress**

Wanke, Nadine; Schwabe, Lars

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Instrumental actions aim at achieving a pleasant or avoiding an unpleasant state and can be controlled by goal-directed behavior based on action-outcome associations or by habitual behavior based on stimulus-response associations. Previous research has shown that stress promotes appetitive habitual over appetitive goal-directed behavior. We investigated whether this finding can be generalized to aversive behavior. Participants were exposed to stress (socially evaluated cold pressor test) or a control condition before they performed a shock-avoidance task in which they learned to perform two instrumental responses directed at avoiding unpleasant electric shocks to their right and left lower leg, respectively. We introduced response costs for responses that were not necessary to avoid a shock. After training, one instrumental response was devalued by removing the respective shock electrodes. Thus, participants could not receive an electric shock to one of their legs any longer, while the other pair of electrodes remained connected and required an instrumental response to avoid a shock. To further explore the relationship between stress and aversive behavior, we recorded measures of physiological arousal and self-reported anxiety, mood and motivation. We expect stressed participants to show greater avoidance habits than the control group, as indicated by a higher number of responses associated with the devalued outcome in the stress group. Data is currently being analyzed and will be presented at the meeting.

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NOTIZEN:

**39** The role of action-based and temporal predictability in sensory attenuation on a behavioural and neural level

Lubinus, Christina; Kircher, Tilo; Straube, Benjamin; van Kemenade, Bianca

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Sensory consequences of one's own action are usually perceived as less intense, and lead to reduced neural responses, compared to externally generated stimuli. It has been thought that this sensory attenuation is due to the efference copy. However, active and passive conditions differ not just with regard to the presence of the efference copy, but also in the temporal predictability of stimulus appearance, which could – at least partly – be responsible for the reported difference in stimulus processing. Here, we investigated the influence of both action based predictability and temporal predictability on the visual perception of stimulus intensity.

During fMRI data acquisition, participants had to judge which one of two visual stimuli was brighter. In active trials, participants caused the appearance of the stimuli by a button press. In the passive condition, the stimuli were presented automatically. In predictable blocks, the stimuli appeared temporally aligned with the button press (active) or aligned with an automatically generated cue (passive). In unpredictable blocks, stimuli were presented with a variable delay after button press/cue, respectively.

Self-generated stimuli were perceived darker and showed less neural activation in visual areas as their passive counterparts, indicating sensory attenuation for self-generated stimuli. An effect of temporal predictability was not found for either of the conditions or modalities. Therefore, our results do not support the claim that differences in temporal predictability are primarily responsible for sensory attenuation in active vs. passive conditions. In our experiment, differences between conditions were primarily driven by action based predictive mechanisms.

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NOTIZEN:



**40 Visual Salience Amplifies Prediction Error Signals in the Ventromedial Prefrontal Cortex**

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Selective attention is required to identify the relevant stimuli associated with an outcome in a complex environment. Few studies, however, have addressed the effects of attention on stimulus-outcome learning. Here, we investigated such effects with fMRI using a modified weather prediction task, which involves probabilistic feedback-based learning. To manipulate attention, we altered the visual contrast of the neutral everyday objects that functioned as cues. Some cues were always presented with high and others with low visual contrast. As salient stimuli can draw attention, this allowed us to investigate the effects of attention on reward learning and decision-making processes. We fit participants' choices using reinforcement learning models to investigate differential effects of salience on learning and decision-making parameters. Our results show that visual salience enhances prediction error signals in the ventromedial prefrontal cortex. Furthermore, visual salience increased functional connectivity between the inferior parietal lobule, a region associated with bottom-up guidance of attention, and the ventral tegmental area, and putamen for reward prediction error signals. Taken together, these results indicate that perceptual features can bias choices by acting on value representations via bottom-up attention mechanisms.

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NOTIZEN:

**41 Acoustic Noise and Transcranial Random Noise Stimulation (tRNS) of Auditory Cortex Equally Enhance Hearing Sensitivity via Stochastic Resonance**

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Stochastic resonance (SR) is a ubiquitous phenomenon in non-linear systems characterized by increased detection rate for subthreshold stimuli when noise at a specific intensity is added to the signal. While there is an emerging body of research evidencing SR as inherent feature of the human visual system, its presence in the human auditory system (HAS) has not been studied comprehensively yet. The present study aimed to fill this gap by investigating the impact of noise on signal detection rate when added to weak acoustic stimuli. In concrete, 45 normally hearing participants were presented with sine wave tones presented at subthreshold intensity in a three-alternative forced choice decision task. Noise was added at different intensities either acoustically (study 1) by means of white noise or electrically (study 2) using transcranial random noise stimulation (tRNS) to the auditory cortex. We found that detection rate was modulated by the applied noise intensity according to an inverted-U-shaped curve - a relationship which is typical for SR. Of note, this effect was found irrespective of the noise modality (i.e. in study 1 and 2). These results qualify SR as the underlying mechanism of noise-enhanced modulations of hearing acuity. Furthermore, our finding of tRNS-increased detection rate for subthreshold acoustic stimuli demonstrates that SR occurs already at cortical stages of auditory processing. Thereby, the present study sheds more light on the role of noise in the HAS and provides important implications for interventions in auditory pathologies.

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NOTIZEN:

**42 Predicting motor imagery neurofeedback aptitude from white matter integrity**

Meekes, Josef<sup>1</sup>; Debener, Stefan<sup>1</sup>; Zich, Catharina<sup>1,2</sup>; Bleichner, Martin Georg<sup>1</sup>; Kranczioch, Cornelia<sup>1</sup>

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Background: Understanding the causes of individual differences in motor imagery neurofeedback (MI-NF) aptitude may contribute to improving the applicability of MI-NF training in (stroke) rehabilitation. Previous research has suggested that fractional anisotropy (FA) of white matter tracts may be used to predict individual MI-NF aptitude (Halder et al., *Front Hum Neurosci* 2013;7(April):1–9.). Since the target population for MI-NF consists mainly of older adults, validation of this finding in an older cohort is crucial. Objective: To assess whether the observation that fractional anisotropy measures can be used to predict MI-NF aptitude generalizes to older adults.

Methods: Twenty-one healthy older adults (mean age 61.4 years – range 48–77 years; 10 females) participated in one session of EEG-based MI-NF. We also obtained 3T diffusion-weighted imaging. Online classification accuracy was categorized as good or poor based on a median split. Shrinkage linear discriminant analysis was used to predict group membership from the average FA values of white matter regions.

Results: Cross-validation accuracy for MI-NF aptitude group membership (good vs poor) using all white matter regions was 85.25% (binomial test:  $p < 0.001$ ). The most frequently used regions were the left anterior corona radiata ( $r = -0.38$ ,  $p = 0.089$ ) and the column and body of the fornix ( $r = 0.37$ ,  $p = 0.096$ ). However, using only the regions reported by Halder and colleagues, cross-validation accuracy decreased to 26.50%.

Conclusion: We replicated the retrospective prediction of MI-NF aptitude from FA values, but the regions used for prediction differed from those reported by Halder and colleagues.

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NOTIZEN:

**43 Risky behaviour in an Iowa Gambling Task is enhanced by an interpersonal competitive context**

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Recent evidence indicates that the propensity to show high risk behaviour in gambling tasks is related to an excessive sensitivity to short-term positive reinforcement relative to long-term outcomes. Here, we examined whether the occurrence of risky behaviour was influenced by a trait-like propensity to engage in risky behavioural tendencies and whether this would be enhanced in a context of interpersonal competition. For this purpose, 20 subjects who reported frequent engagement in risky behavioural tendencies (e.g., substance abuse) were recruited (high risk group – HR) and compared to 20 low risk participants (LR). Participants performed an adapted version of the Iowa Gambling Task (IGT). Here, higher short-term rewards were associated with larger long-term losses, whereas lower short-term rewards were more advantageous in the long-run. Participants performed the task either alone (individual condition) or against a confederate of the experimenter (competition condition). Results indicate that HR and LR participants differed significantly in IGT performance during the individual condition. Here, LR displayed behaviour associated with long-term rewards more frequently and achieved higher IGT scores. In the competition condition, this behavioural pattern was enhanced. In addition, HR participants displayed risk behaviour (i.e., short term rewards) more often and achieved lower IGT scores with this behavioural strategy. Taken together, these results suggest that the habits of weighting rewards and punishments that give rise to risk behaviour also depends on the social properties of the context, in which the outcomes of behaviour are being evaluated.

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NOTIZEN

**44 Investigating semantic context effects on language production with a combined eye tracking and picture naming paradigm**van Scherpenberg, Cornelia<sup>1,2,3</sup>; Obrig, Hellmuth<sup>1,2,3</sup>; Abdel Rahman, Rasha<sup>1,4</sup>

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Word production has been shown to be highly dependent on context and task requirements, which can either inhibit or facilitate this process. Using a novel, combined eye tracking and picture naming paradigm the study aims to assess how speakers perceive a given semantic context and how they use this context to select the appropriate linguistic denotation for real world objects. The participants' (30 German native speakers) eye movements are tracked while viewing a set of eight words, of which a minimum of three belong to the same semantic category. They then have to name a picture that is either related or unrelated to the word set. We analyze the effects of semantic relation and of the number of related items shown in the context set on word production speed and accuracy. In addition, using eye tracking we explore the relationship between naming latencies and pre-verbal cognitive processing of the semantic relations between the word stimuli. We expect increased fixation durations on related vs. unrelated items and increased naming latencies proportional to the number of related items in the context set, and to the amount of time participants fixate on these words relative to unrelated words. The study therefore provides a relevant extension to the current research on semantic context effects, as it investigates how the size and processing intensity of a given semantic context are causally related to word production. In further experiments these findings will be compared to task behavior in a clinical population with aphasia after stroke

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NOTIZEN

**45 The Influence of Prior Physical Practice on Neurophysiological Correlates in a Reach-to-Grasp Motor Imagery Training Paradigm**

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Motor Imagery practice (MI) combined with neurofeedback is a promising supplement to physical rehabilitation interventions for motor impairments following neurological disorders such as stroke. Basic research in healthy participants aimed at developing and improving MI-based neurofeedback interventions, is hampered by the simplicity of tasks tailored to paretic stroke patients, as they allow for little or no measurable motor improvement through training. In contrast, more complex motor tasks have the disadvantage of not being transferable to a rehabilitation setup and having little everyday relevance. This study investigates oscillatory brain activity and motor learning in healthy participants in a complex visuo-motor task consisting of a variant of an everyday reach-to-grasp movement that allows adjustment of task difficulty along various dimensions. Participants were assigned to either of two groups and each of them performed a total of 256 trials. The first and the last eight trials were motor execution trials (ME). For the remaining trials one group (N=20) performed 240 MI trials, while the other group (N=20) performed 80 ME trials followed by 160 MI trials. 64 channel electroencephalogram (EEG), electromyogram (EMG) and electrodermal activity (EDA) were recorded, and an inertial measurement unit (IMU) tracked the movement in space. We expect to see improvements in performing the reach-to-grasp movement and associated changes in oscillatory brain activity, both should be more pronounced in the group with ME training prior to the MI training phase.

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NOTIZEN

**46 Covariation bias as a predictor of treatment response in depression**

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Negative affective information-processing biases characterize major depressive disorder (MDD). Covariation bias, the overestimation of the relationship between fear-relevant stimuli and aversive consequences, is a well investigated cognitive bias in anxiety disorders. The present study aimed at investigating whether patients with MDD display similar covariation bias between negative stimuli and aversive consequences as seen as in anxiety disorders.

To this end, covariation estimates of 62 inpatients with MDD and 31 matched controls were assessed at admission (n=31) and after 6 weeks of treatment (n=31). Participants viewed negative, positive and neutral stimuli, which in 50% of trials were followed randomly by a burst of white noise. Participants were psychometrically characterized (Global Assessment of Functioning, GAF; Clinical Global Impression Scale, CGI, Beck Depression Inventory, BDI; Trait Scale of the State-Trait Anxiety Inventory, STAI-T). Group differences were analyzed by ANOVAs, relationships between continuous variables by regression analyses.

No differences regarding covariation estimates were observed between groups. In the patient group, however, covariation score at admission was significantly correlated with treatment response (GAF, CGI) and self-report measures (BDI, STAI-T): Patients with a greater covariation bias showed greater impairment and had a worse level of functioning after 6 weeks of treatment.

Here, we for the first time investigated illusory correlations in MDD and their relationship to therapy response. Our findings suggest a link between this type of cognitive bias and treatment response. The covariation bias may constitute a possible marker in the field of implicit processing in the search for effective predictors of therapy outcome.

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NOTIZEN:

**47 The effects of sleep deprivation and recovery sleep on pain: A systematic review of human data**

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Background: Sleep deprivation (SD) leads to hyperalgesic pain system changes. Considering that sleep helps to regulate bodily functions, it seems reasonable that recovery sleep subsequently to SD helps to restore occurring hyperalgesic changes.

Aims: The aim of this literature review was to examine whether recovery sleep helps to normalize pain system changes, taking potential moderating variables (sample size, age, SD design and length, length of recovery sleep, pain induction methods, measures of pain perception) into account.

Methods: Empirical human studies (healthy and clinical samples) including SD paradigms, recovery sleep, and pain assessment(s) were searched in three databases (PubMed, Web of Science, PsycINFO) using a predefined algorithm. Irrelevant articles were excluded by screening of abstracts or full texts. Overall 13 studies were selected for this review. Results: Recovery sleep following total sleep deprivation (TSD) was found to rapidly normalize pain complaints, pain unpleasantness and mechanical pain thresholds.

Furthermore, slow wave sleep (SWS) rebound after TSD was associated with an analgesic effect. The effects of recovery sleep following other sleep deprivation designs (sleep restriction, forced awakenings, rapid-eye-movement (REM) SD, SWS deprivation) were less clear. Generally speaking deteriorated pain thresholds and spontaneous pain complaints normalized after recovery sleep.

Conclusions: Findings indicate that recovery sleep normalizes pain thresholds and symptoms, with the effect being strongest after TSD. SWS rebound during recovery sleep underlines an important role of SWS for normalization of pain processing.

Implications: Characteristics of recovery sleep linked to the normalization of the pain system have to be further elucidated.

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NOTIZEN:



**48 Testosterone treatment for depression in males: A meta-analysis**

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**Importance:** Countering major depressive disorder (MDD) is a public health priority and antidepressants based on monoamine neurotransmission are the first-line treatment approach. In men, testosterone treatment (TT) emerges as promising alternative or adjunct treatment option.

**Objective:** To conduct a meta-analysis of RCTs examining the effect of TT on depression in men.

**Data Sources:** English-language studies published or accepted for publication in peer-reviewed journals identified from PubMed/Medline, EMBASE, Scopus, PsycINFO, and the Cochrane Controlled Trials Register from the first available year to October, 2017. **Study Selection:** Randomized placebo controlled trials of TT in men for improvement of depressive symptoms including men of different age ranges, hypo- and eugonadal men, severely depressed, mildly depressed, and subthreshold depressed men, as well as HIV infected men.

**Results:** Multilevel random-effect meta-analysis for the final 27 identified studies suggested that TT leads to a significant reduction in depressivity compared to placebo (Hedges'  $g$ : 0.41, CI95%: 0.18-0.65,  $p=0.002$ ). Meta-regression models for different study-level moderators showed statistically significant interactions for TT with dose and treatment duration. Proceeding from the most conservative bias scenario, TT remained significant whenever higher doses with longer TT regimes (i.e. >30 weeks) were employed.

**Conclusions and Relevance:** TT appears efficacious and effective as a treatment for reduction of depressivity in men particularly when higher doses and longer treatment regimens were applied. Acceptability for TT is excellent. Due to a noticeable lack of high quality studies, recommendations are made concerning how future trials can address remaining uncertainties and improve the standard of the field.

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NOTIZEN:

**49** Trauma disclosure moderates the effects of oxytocin on intrusions and neural responses to fear

Scheele, Dirk<sup>1</sup>; Lieberz, Jana<sup>1</sup>; Patin, Alexandra<sup>1</sup>; Engels, Christine<sup>1</sup>; Schneider, Lía<sup>1</sup>; Stoffel-Wagner, Birgit<sup>1</sup>; Becker, Benjamin<sup>2</sup>; Hurlemann, René<sup>1</sup>

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Background: Traumatic experiences can lead to posttraumatic stress disorder (PTSD) with clinical manifestations including intrusions, avoidance behavior, and hyperarousal. There is preliminary evidence that post-trauma administration of the neuropeptide oxytocin (OXT) could be effective as a preventive intervention for PTSD in individuals exhibiting strong PTSD symptoms. However, the neurobiological mechanisms by which OXT influences traumatic experience are still unclear.

Methods: In a randomized, double-blind, placebo (PLC)-controlled, parallel-group study design, 62 healthy women were exposed to the same experimental trauma twice and intranasal treatment (24 IU OXT, PLC) was administered for six consecutive days. Functional magnetic resonance imaging was used to assess neural responses to fearful faces after the first (before OXT treatment) and the second trauma exposure (after three days of treatment). Furthermore, intrusive memories in daily life were recorded for six days.

Results: In the PLC group, intrusions negatively correlated with prefrontal cortex (PFC) activation and were positively associated with amygdala responses to fearful faces. There was no main treatment effect on intrusive memories, but exploratory analyses revealed that OXT significantly reduced intrusions in participants with strong PTSD-like symptoms and trauma disclosure. On the neural level, these effects were paralleled by increased PFC activation and enhanced functional PFC-amygdala coupling in response to fearful faces after OXT treatment selectively in participants with strong trauma disclosure.

Conclusions: Collectively, our data indicate that prolonged OXT treatment in combination with strong trauma disclosure may reduce trauma-induced intrusions by strengthening PFC-mediated top-down control of amygdala reactivity.

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NOTIZEN:

**50 Late heartbeat-evoked potentials, indicators of cortical representation of interoceptive signal processing, are associated with survival after cardiac arrest**

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Rationale: Cardiac arrest (CA) is a serious condition characterized by high mortality rates, even after initial successful resuscitation, mainly due to neurological damage. Whether brain-heart communication is associated with outcome after CA is unknown. Heartbeat-evoked brain potentials (HEPs) represent neurophysiological indicators of brain-heart communication, as they reflect cortical representation of interoceptive signal processing. The aim of this study was to address the association between HEPs and survival after CA.

Methods: HEPs were calculated from resting EEG/ECG in 55 CA patients 24 h after resuscitation. All patients were treated with targeted temperature management and a standardized sedation protocol during assessment. We investigated the association between HEP amplitude (180–320 ms, 455–595 ms, 860–1000 ms) and 6-month survival. Results: Twenty-five of 55 patients (45%) were still alive at 6-month follow-up. Survivors showed a higher HEP amplitude at frontopolar and frontal electrodes in the late HEP interval than non-survivors. This effect remained significant after controlling for between-group differences in terms of age, Fentanyl dose, and time lag between resuscitation and EEG assessment. There were no group differences in heart rate or heart rate variability.

Conclusion: Brain-heart communication, as reflected by HEPs, is associated with survival after CA. Cardiovascular autonomic arousal may not be involved in mediating this effect. Adequate cortical representation of interoceptive signals may be essential to preserve cardiovascular health and should be in the focus of prevention strategies. Future studies should address the brain-heart axis in CA.

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NOTIZEN:

**51 Schmerzhafter Steady-State Stimulation als Tool für die psychophysiologische Schmerzforschung**

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Die experimentelle Schmerzforschung hat bislang hauptsächlich kurze Stimuli genutzt. Ihre ökologische Validität ist mit Blick auf klinischen Schmerz allerdings zu hinterfragen. Validere natürliche Stimuli bergen die Gefahr der Verletzung. Daraus ergibt sich die Notwendigkeit von neuen Stimulationsmethoden, mit Blick auf klinischen Schmerz längerfristig eingesetzt werden können, die Probanden aber nicht verletzen. Eine solche Methode könnte die elektrische Steady-State-Stimulation (eSSS) darstellen. Die eSSS aktiviert die nozizeptiven Fasern direkt, so dass eine noxische Stimulation nicht nötig ist. Ziel der vorliegenden Studie war die Testung der eSSS in einem psychophysiologischen Experiment mit dem Ziel der zukünftigen Nutzung in psychophysiologischen Forschung. 28 Versuchspersonen nahmen an der Untersuchung teil. Sie erhielten eSSS am linken Mittelfinger für 2, 4, der 6 Sekunden mit 2 unterschiedlichen Intensitäten mittels intrakutaner Stimulation (DS5, Digitimer, Welwyn Garden City, UK). 100 Trials wurden appliziert, bei denen das EEG aufgezeichnet wurde.

Das Experiment musste bei 4 Personen wegen starker Habituation (n=2) oder Sensitivierung (n=2) vorzeitig abgebrochen werden. Zwei weitere Personen berichteten neben der Wahrnehmung während der Stimulation von pulsierender Wahrnehmung über die Stimulation hinaus.

Im EEG fanden sich evozierte Potentiale am Stimulationsbeginn, die denen von kurzen Stimuli gleichen. Sie sind für die höhere Intensität höher als für die geringere Intensität. Daneben fanden sich bei den meisten Vp Steady-State-Aktivitäten, entweder in der Stimulationsfrequenz oder in Harmonischen dieser Frequenz. Alles in allem stellt die eSSS ein interessantes Tool für die experimentelle und klinische psychophysiologische Schmerzforschung dar.

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NOTIZEN:

**52 Shifts in the Functional Topography of Frontal Cortex-Striatum Connectivity in Alcohol Use Disorder**

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A well-established organizational principle of the frontal cortex are parallel cortico-striato-thalamo-cortical loops which establish a hierarchy from reward over cognitive to motor systems along a ventral-medial-rostral to dorsal-lateral-caudal gradient. Fronto-striatal connections, constituting the first segment of these loops, occur within and outside of the recurrent loops, and the behavioral and clinical relevance of inter-individual differences in the functional topography of these connections is hitherto an open question.

We developed a method based on spatial coordinates of frontal voxel peak connectivity in the striatum and Principle Component Analysis (PCA) to assess the functional architecture of fronto-striatal connectivity. We applied this approach to explore associations with Alcohol Use Disorder (AUD) in a resting state functional magnetic resonance imaging (fMRI) data set of  $n=66$  detoxified patients with AUD and  $n=40$  healthy participants.

A SPM12 group comparison identified the right orbitofrontal cortex (rOFC) which exhibits a shift in peak connectivity towards more ventral parts of the striatum in patients with AUD (peak-level  $p=0.044$ , FWE corr.). A post-hoc inspection of the connectivity peaks shows a reduction in variability in the AUD group, which suggests a “clamping” of the rOFC to the ventral striatum as the underlying effect.

Within the patient group we were able to identify associations of striatal peak connectivity location of the right superior frontal gyrus with confidence to abstain from alcohol, of the medial and lateral prefrontal cortex with self-reported dependence severity, and of the right inferior frontal cortex with the self-reported urge to drink alcohol.

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NOTIZEN:

**53** Modulation of respiration pattern variability and default mode network connectivity in remitted depression

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It was shown that default mode network (DMN) connectivity is stronger and respiration pattern variability (RPV) higher in depression. Both features are associated with each other and also with worse outcome and the course of the disorder. The aim of the present study was to investigate whether emotionally challenged remitted depressed participants (rMDD) show reduced DMN connectivity and lower RPV after short mindfulness or relaxation trainings. To challenge participants, sad mood was induced with keywords of personal negative life events in rMDD during fMRI before and after a one month mindfulness based attention (MBAT; n=21) or progressive muscle relaxation (PMR; n=24) training. Respiration was measured by means of a built-in respiration belt.

After both trainings, rMDD showed no significant change in brain connectivity. However, they showed reduced RPV: Whereas PMR was more effective in reducing the main respiration rate, MBAT was more effective in the reduction of expiratory pause duration variance. Interestingly, in the PMR group, the effect was larger in medicated participants, whereas in the MBAT group, training seems to be less effective when participants had more inpatient treatments.

The results suggest that RPV can be positively influenced by both trainings which may hint to an underlying biological pathway of training effects. Importantly, they seem to be partly modulated by severeness, vulnerability and medication. As both trainings were short and not focused on respiration per se, we assume that a longer respiration focused training might cause stronger effects, possibly also in regard to brain connectivity changes.

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NOTIZEN:

**54 Funktionelle Dyskonnektivität des dorsalen Nucleus Caudatus: Assoziation mit der Symptomatik von Schizophrenie**

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Schizophrenie ist eine der schwerwiegendsten neuropsychiatrischen Erkrankungen. Sie zeichnet sich durch Symptome wie Wahnvorstellungen, Halluzinationen oder desorganisierte Sprache aus und trägt erheblich zur globalen Krankheitslast bei. Neuartige neurowissenschaftliche Behandlungsansätze versuchen die der Störung zu Grunde liegende Reduktion neuronaler Konnektivität zu verändern, zum Beispiel mittels funktionellem Echtzeit-Magnetresonanztomographie-Neurofeedback. Für die Entwicklung solcher Behandlungsansätze ist zunächst eine Charakterisierung von pathologischen Netzwerkveränderungen nötig. In einem Vergleich der fMRT-Ruhemessungen von ersterkrankten, unmedizierten schizophrenen Patienten und gesunden Verwandten ersten Grades mit gesunden Kontrollen fanden Fornito et al. (2013, JAMA Psychiatry) eine krankheitsassoziierte verminderte Konnektivität des Striatums, insbesondere des dorsalen Nucleus Caudatus (dNC) mit dem linken dorsolateralen präfrontalen Kortex (DLPFC). Ziel unserer Studie war es zu überprüfen, ob sich dieser Befund auch in einer Gruppe von ebenfalls ersterkrankten aber bereits stabil medizierten Patienten (N=19) replizieren lässt. Dazu verglichen wir die funktionelle Konnektivität des dNC dieser Patienten mit einer geschlechtsgematchten Gruppe gesunder Kontrollen (N=19). Anschließend wurde innerhalb der schizophrenen Patienten überprüft, ob die Konnektivität des dNC mit der Positiv- und Negativ-Syndrom-Skala (PANSS) korreliert. Während sich beide Gruppen in ihrer dNC-Konnektivität nicht signifikant voneinander unterscheiden, zeigten sich innerhalb der schizophrenen Patienten signifikante Zusammenhänge der Konnektivität des dNC mit dem Broca-Areal, dem anterioren cingulären Kortex und der rechten anterioren Insula mit den PANSS-Skalen ( $p < 0.05$  cluster-level corr.) und insbesondere eine Assoziation der Negativsymptomatik mit verringerter dNC-Konnektivität mit dem rechten DLPFC ( $p = .025$ , peak-level FWE corr.). Während wir die Ergebnisse von Fornito et al. (2013) nicht direkt replizieren konnten, so liefern diese Ergebnisse weitere Hinweise auf Zusammenhänge des dNC-DLPFC-Netzwerks mit der Symptomatik der Schizophrenie.

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NOTIZEN:

**55** Dissociation of ventral and dorsal cortico-striatal networks in patients with OCD suggests targets for therapeutic change

Balzus, Luisa<sup>1,2</sup>; Kaufmann, Christian<sup>2</sup>; Grützmann, Rosa<sup>2</sup>; Klawohn, Julia<sup>2</sup>; Riesel, Anja<sup>2</sup>; Heinzl, Stephan<sup>3</sup>; Bey, Katharina<sup>4</sup>; Lennertz, Leonard<sup>4</sup>; Wagner, Michael<sup>4</sup>; Kathmann, Norbert<sup>2</sup>

<sup>1</sup>Berlin School of Mind and Brain; <sup>2</sup>Humboldt-Universität zu Berlin; <sup>3</sup>Freie Universität Berlin; <sup>4</sup>University of Bonn

**Introduction:** Overactive performance monitoring, as indicated by an enhanced error-related electrophysiological potential, is considered as a central mechanism in obsessive-compulsive disorder (OCD). In a previous study, we observed (post hoc) that during error processing, patients with OCD (N = 22) showed hyperactivity in dorsal cognitive regions and less relative deactivation in ventral affective regions compared to matched healthy controls (N = 22). We aimed to replicate these findings with an independent and larger sample and to characterize functional connectivity of ventral and dorsal cortico-striatal networks.

**Method:** Functional magnetic resonance imaging (fMRI) data were collected from 81 patients with OCD and 81 matched healthy controls during a flanker task. Hemodynamic responses following errors and functional connectivity were compared between groups.

**Results:** Patients with OCD exhibited increased error-related activation in dorsal cognitive regions, including the lateral prefrontal and parietal cortex, while showing reduced relative deactivation in ventral affective regions, including the orbitofrontal cortex (OFC), medial prefrontal cortex (mPFC), and insula. Connectivity within the ventral affective network, specifically between amygdala and mPFC, and thalamus and OFC, was increased in patients. Unlike control subjects, patients exhibited no increase in coupling within the dorsal cognitive network, specifically between the basal ganglia, lateral prefrontal cortex, and parietal cortex.

**Discussion:** These alterations point to enhanced recruitment of cognitive control, possibly as a compensatory mechanism for enhanced affective processing during performance monitoring in OCD. From a clinical perspective, networks engaged in error processing might be potential targets for future treatment approaches, such as neuromodulatory techniques or cognitive training.

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NOTIZEN:



**56** A TMS study on visual imagery in reasoning

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Introduction. Visual mental imagery is the subjective experience of seeing objects/events in front of the ‘inner eye’, although they are not present. Research indicates that (1) visual images help to remember what has been experienced in the past or when objects need to be inspected or manipulated, and (2) visual images are correlated with neural activity in early visual cortices, demonstrating an overlap between visual imagery and visual perception. However, visual imagery can also disrupt cognitive processes and impede thinking, known as the visual impedance effect [Knauff, M., & Johnson-Laird, P. N. (2002). Visual imagery can impede reasoning. *Memory & Cognition*, 30, 363–371]. So, what happens if it becomes more difficult to construct visual images in primary visual cortex during reasoning? Methods. In this transcranial magnetic stimulation experiment, ten participants solved 36 relational reasoning problems that varied in their imageability. For instance, easy to visualize are relations such as “cleaner-dirtier”, while relations such as “smarter-dumber” are difficult to visualize mentally. While solving the problems, eight 10Hz pulses were either applied to primary visual cortex (V1) or a control site (Vertex). Results and Discussion. The findings suggest a causal link between mental imagery, primary visual cortex, and reasoning with visual problems. Moreover, when the construction of mental images in the visual cortex was disrupted by TMS, the visual impedance effect decreased. We conclude that (1) the visual cortex is necessary for visual mental imagery, (2) visual imagery can impede reasoning, and (3) the suppression of visual images can facilitate reasoning.

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NOTIZEN:

**57 Real-time fMRI neurofeedback training to improve self-regulation of the dorsolateral prefrontal cortex in obese subjects: a single-blind randomized controlled trial**

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Obesity is associated with altered responses to food stimuli in prefrontal brain networks that mediate inhibitory control over ingestive behavior. In particular, the dorsolateral prefrontal cortex (dlPFC) shows reduced activation in obese compared to normal-weight individuals. We conducted a randomized controlled trial to investigate the effects on eating behavior of an fMRI-based neurofeedback training to up-regulate dlPFC activity in obese individuals.

Thirty-eight overweight or obese individuals took part and were randomly allocated to one of two groups. During neurofeedback, the active group trained to increase dlPFC activation (n=17) whereas the control group was instructed to target visual areas (n=21). The training comprised three runs and took place on a single day. Different aspects of ingestive behavior were assessed before and after training and in a follow-up session four weeks later. Participants of both groups up-regulated activity in the respective target area. At follow-up compared to baseline, both groups rated pictures of high-, but not low-calorie foods as less palatable and chose them less frequently. Actual snack intake remained unchanged. The control group also showed co-activation of the dlPFC and, moreover, greater expectations regarding training success, which might have led to comparable eating-related behavioral changes.

We conclude that within one session of fMRI-neurofeedback training, obese individuals can up-regulate dlPFC activity, which might favor improved self-control during food choices. Although the relative unspecificity of the effects requires further investigation, these results suggest that neurofeedback training to improve inhibitory control could be a beneficial new approach to normalize eating behavior in obesity.

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NOTIZEN:

**58** Socio-motivational (in-)dependence in adolescence and their feedback-related brain response during reinforcement learning

Hoferichter, Frances<sup>1</sup>; Raufelder, Diana<sup>1</sup>; Böhme, Rebecca<sup>2</sup>; Romund, Lydia<sup>2</sup>; Pelz, Patricia<sup>2</sup>; Golde, Sabrina<sup>2</sup>; Lorenz, Robert C.<sup>3</sup>; Gleich, Tobias<sup>2</sup>; Beck, Anne<sup>2</sup>

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To examine individual differences in motivation and learning patterns, both the concept of socio-motivational (in-)dependence and reinforcement theory base their rationale on the interaction between individuals and their environment. Learning takes place in social environments, such as school settings, while reward and punishment represent the underlying driving mechanism of social learning. By investigating the neurobiological correlates of these learning mechanisms we aim to give insight in why some individuals depend on the reinforcing aspects of scholar motivators (peers and teachers), while others do not. Accordingly, this multi-methodological study applies functional magnetic resonance imaging (fMRI) to investigate neural activation in a group of adolescent students (N = 88) during a probabilistic reinforcement learning task. We related patterns of emerging brain activity and individual learning rates to socio-motivational (in-)dependence represented by four different motivation types (MT): (1) peer-dependent MT, (2) teacher-dependent MT, (3) peer-and-teacher-dependent MT, (4) peer-and-teacher-independent MT. A multinomial regression analysis revealed that the individual learning rate predicts students' membership to the independent MT, or the peer-and-teacher-dependent MT. Additionally, the striatum, a brain region associated with behavioral adaptation and flexibility, showed increased learning-related activation in students with motivational independence. Moreover, the prefrontal cortex, which is involved in behavioral control, was more active in students of the peer-and-teacher-dependent MT. Overall, this study offers new insights into the interplay of motivation and learning with (1) a focus on inter-individual differences in the role of peers and teachers as source of students' individual motivation and (2) its potential neurobiological basis.

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NOTIZEN:

**59 Sleep in individuals at risk of bipolar disorder**

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**Objectives:** Individuals with hypomanic personality are extraverted, impulsive, energetic, overconfident, and intensely emotional. Beyond this, they are at an increased risk of bipolar disorder (BD, ‘manic-depressive illness’). Given the pathogenic role of disturbed sleep in BD, we investigated whether sleep alterations may also be related to hypomanic personality.

**Methods:** Participants filled in the Hypomanic Personality Scale (HPS; N = 1890) and either underwent a seven-day actigraphy assessment (n = 771) or completed the Pittsburgh Sleep Quality Index (PSQI; n = 1766), or both. We analyzed whether the HPS total score and the three HPS facets ‘hypomanic core’, ‘sociability’, and ‘ordinariness’ (as derived from factor analyses) are associated with the fourteen objective and seven subjective sleep variables.

**Results:** In total, 40 out of 84 correlations were significant after multiple testing correction (FDR <0.05). HPS was associated with shorter, less efficient and a particularly higher variability of objectively assessed sleep. Likewise, HPS was associated with the questionnaire data, i.e. with shorter and less efficient sleep, higher daytime sleepiness, and overall lower sleep quality. The most significant associations were obtained between the PSQI total score (indicator for poor subjective sleep quality) and HPS facet hypomanic core ( $\rho = .158$ ,  $p = 3E-11$ ) as well as facet ordinariness ( $\rho = -.165$ ,  $p = 3E-12$ ).

**Conclusion:** The current study reveals compelling evidence for sleep alterations in individuals at risk of BD. Similar to relapse prevention strategies in BD, the modification of sleep habits might be a valuable approach to avert mood episodes in individuals with hypomanic personality.

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NOTIZEN:

**60 Independent ERP predictors of evaluative priming underline the importance of depth of processing, discrimination of prime affect, and implicit affect misattribution**

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We used event-related potentials to investigate the mental processes that contribute to evaluative priming, that is, a systematic shift of evaluative judgments about neutral targets toward the valence of the primes. 64 Participants rated their liking of a-priori neutral Korean ideographs that were preceded by optimally presented emotional prime words, while 64-channel EEG was recorded. We observed a significant evaluative priming effect that was associated with a larger valence unspecific posterior positive slow wave (PSW) in the prime ERP, suggesting deeper prime processing. Valence dependent variations of fronto-central prime P1 indicated early discrimination of the primes' affect to further strengthen evaluative priming. Conversely, depth of target processing as indicated by late range posterior target PSW was reduced as behavioral priming increased. Furthermore smaller right-parietal target PSW for target ideographs following negative as compared to positive primes provides strong evidence for implicit affect misattribution as one major source of evaluative priming. In a linear regression analysis, the two valence unspecific ERP indices of processing depth (prime PSW, target PSW), the indicator of early prime valence discrimination (prime P1) and the prime valence effect on target PSW were independent predictors of the size of the behavioral priming effect. Together, the four variables accounted for 46% of the variance.

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NOTIZEN:

**61** Effekte von Hydrocortison auf den autobiographischen Gedächtnisabruf und deren neuronale Korrelate bei gesunden Kontrollprobandinnen

Metz, Sophie<sup>1</sup>; Fleischer, Juliane<sup>1</sup>; Otte, Christian<sup>1</sup>; Wolf, Oliver T.<sup>2</sup>; Wingenfeld, Katja<sup>1</sup>

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Bisherige Studien konnten zeigen, dass eine einmalige Gabe des synthetischen Glucocorticoids Hydrocortison zu einer Verschlechterung des autobiographischen Gedächtnisabrufes bei gesunden Kontrollprobanden und -probandinnen führte. Nach Gabe von Hydrocortison wurde eine verringerte Aktivität des medialen Temporallappen, Hippocampus, Amygdala und prä-frontalen Regionen gefunden. Allerdings fehlen bisher Studien, die den Einfluss von Hydrocortison auf neuronale Korrelate des autobiographischen Gedächtnisabrufes untersuchen. Ziel der vorliegenden Studie ist somit, die zu Grunde liegenden neuronalen Mechanismen der Verschlechterung des autobiographischen Gedächtnisabrufes nach Hydrocortisongabe genauer zu untersuchen. Wir schlossen 33 gesunde Frauen in die Studie ein. In einem Placebo kontrollierten cross-over-Design wurde den Probandinnen zu einem Messzeitpunkt ein Placebo und zu dem anderen Messzeitpunkt 10mg Hydrocortison verabreicht. Mittels funktioneller Magnetresonanztomographie (fMRT) wurden neuronale Korrelate des autobiographischen Gedächtnisabrufes zu beiden Testzeitpunkten untersucht. Den Probandinnen wurden 25 Adjektive unterschiedlicher Valenz präsentiert, woraufhin sie ein Ereignis aus ihrer Biographie erinnern sollten. Die Untersuchungen (Hydrocortison vs. Placebo) wurden mit mindestens einer Woche Abstand und unter Verwendung von Parallelversionen der Gedächtnistestung durchgeführt. Erste Analysen konnten zeigen, dass es unter Hydrocortison vor allem im anterioren medialen präfrontalen Kortex zu einer Verringerung der neuronalen Aktivität während des autobiographischen Gedächtnisabrufes kommt. Unsere Ergebnisse bestätigen vorliegende Literaturangaben zu der Rolle des anterioren medialen präfrontalen Kortex für den autobiographischen Gedächtnisabruf und des Einflusses von Hydrocortison auf präfrontale Areale.

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NOTIZEN:

**62 Choice-Induced Modification of Value Memories Guides Future Decision-Making**

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Introduction: Memory representations of option values guide decisions. However, decisions themselves might shape value-related memories of choice options. An option might be preferred simply because it was chosen in the past. As evidence for this effect remains scarce, we tested whether choices modify value memories of chosen and unchosen options in three experiments. Methods: Participants (n=120 total) learned to associate six neutral stimuli (kanjis) with three differently valued outcomes (food pictures) by Pavlovian conditioning. Each outcome was paired with two kanjis. In a revaluation phase, we asked participants to choose: a high value versus an intermediate value option (kanji, Experiment 1), an intermediate value versus a low value option (Exp.2), or an intermediate value option versus both a low and an intermediate value option (Exp.3). During a subsequent probe phase, participants chose between all learned options.

Results: In the probe phase, options that had been chosen during the previous revaluation phase were chosen more frequently. Conversely, choice probabilities of options that had been unchosen were lower compared to the same-valued options that were not seen during revaluation phase (Exp.1 and Exp.2). Crucially, this double dissociation was absent when the intermediate value kanji was chosen and unchosen equally often (Exp.3).

Discussion: Our results suggest that simply choosing an option increases, whereas not choosing an option reduces its subjective value in the absence of an outcome. The current studies provide evidence for choice-induced revaluation in humans. These effects might be due to choice-related alterations of neural associations between choice options and outcomes.

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NOTIZEN:



**63** Temporal and spatial dynamics of working memory based decision-making

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In decision making, choice options are often separated by a delay. This requires organisms to maintain a working memory representation of the first option's value. However, it is unclear how a representation of option value is maintained. In the present study, we used MEG (n=20) and multivariate pattern classification in source space to track the spatiotemporal dynamics of distributed cortical value representations over a delay.

We observed significant representations of both the option's integrated value and the individual parameters (reward probability and magnitude) that jointly determined option value. These representations emerged after option presentation, remained significant early in the delay, and declined towards chance levels near the end of the delay before they were reinstated following presentation of the second option. Importantly, this latter effect cannot be driven by the presentation of the second stimulus. The value representations showed little evidence for cross-temporal generalization in the early delay, indicative of highly dynamic coding. The neural representations showed a spatial progression, with value representations first emerging in early visual cortical areas during stimulus presentation and then propagating to inferotemporal and lateral prefrontal cortex, before being reinstated in early visual cortical areas upon presentation of the second option. The degree to which the neural representation of the first option's value was decodable prior to choice was also predictive of the degree to which subjects' choices were guided by the value of this option.

Our findings provide evidence for how option values are represented "offline" when task demands impose a working memory requirement.

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NOTIZEN:

**64** Retroactive memory enhancement through aversive learning:  
A replication attempt

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Humans do not always know whether an event is meaningful or not. It is therefore adaptive to store seemingly irrelevant encounters transiently in memory, in case the event acquires relevance later on. Recent evidence suggests indeed a so-called ‘behavioral tagging’ mechanism through which initially weak memories are enhanced by subsequent experience of relevance. This effect is supposed to be confined to stimuli that are conceptually related to the subsequent event. In the present experiment, we aimed to replicate this retroactive memory enhancement through aversive learning. To this end, participants were presented images of tools and animals in three learning phases. In the second learning phase, images from one category, but not from the other, were paired with an aversive electric shock. The conditioned category was randomized and counter-balanced across participants. Skin conductance data showed successful fear conditioning. Furthermore, results from a surprise recognition test 24 h after initial learning revealed enhanced recognition memory for stimuli that were paired with shocks in the second learning phase compared to unconditioned stimuli. Importantly, however, recognition for the conditioned vs. unconditioned category differed neither for items that were presented before nor after the fear conditioning. Thus, the present study could not replicate the proposed retroactive enhancement of memory through aversive experiences.

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NOTIZEN:

**65** **Conditional reasoning with deductive and probabilistic instructions: An fMRI experiment**

Gazzo Castaneda, L. Estefania; Sklarek, Benjamin; Dal Mas, Dennis; Knauff, Markus

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Deductive theories of human reasoning investigate people's capacity to draw valid conclusions from given premises. For instance, given the conditional "If Jack does sports, then he loses weight" and the fact "Jack does sports" it follows that "Jack loses weight". Such deductive inferences can be done without reference to prior knowledge. Probabilistic theories, instead, argue that conditionals are not understood deductively, but that people understand conditionals as the conditional probability. The acceptance of the conclusion "Jack loses weight" thus depends on the probability of Jack losing weight given he does sports. Prior knowledge is therefore essential for probabilistic theories because it is needed for computing probabilities. In an fMRI study we investigate whether these approaches can be distinguished on a neuronal level. We embedded conditionals with high and low conditional probabilities as well as abstract conditionals ("If the box is blue, then it is open") in valid and invalid inferences. Participants had to evaluate these conditionals from a deductive or a probabilistic perspective, and could switch dynamically between a dichotomous and a scaled response format. Behavioral results show that participants used the dichotomous response format more often for the deductive than the probabilistic instruction, and that prior knowledge only affected participants under the probabilistic instruction. The fMRI results show stronger DLPFC activations during deductive compared to probabilistic reasoning. This can be linked to a suppression of prior knowledge in deductive reasoning. We conclude that people can reason deductively and probabilistically and that different neuronal processes underlie deductive and probabilistic reasoning.

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NOTIZEN:

**66** Neural correlates of perceptual and retroactive spatial attention in feature-based and spatially specific auditory search: insights from lateralized alpha band oscillations

Klatt, Laura-Isabelle; Getzmann, Stephan; Wascher, Edmund; Schneider, Daniel

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Deutschland

Alpha-band oscillations (~8–12 Hz) have been shown to track the attended location in perceptual visual and auditory space. While similar findings exist associated with the deployment of spatial attention in visual working memory representations (i.e., retroactive attention), little is known about the neural correlates of auditory retroactive attention. Beyond that, it is still under debate to what extent alpha power modulations operate analogously during non-spatial, feature-based shifts of attention. Using electroencephalography, the current study investigates the involvement of alpha power oscillations in the deployment of auditory attention in a perceptual and a retroactive auditory search paradigm. For both search types, participants completed two separate task blocks, either indicating the position (i.e., sound localization) or the presence or absence (i.e., sound detection) of a target sound within an auditory search array, consisting of two lateralized, simultaneously presented animal sounds. Consistent with visual attention studies, analyses revealed a lateralization of alpha power over posterior scalp sites in both perceptual and retroactive sound localization trials. This finding corroborates the conceptualization of alpha oscillations as a supramodal attention mechanism. The observed alpha lateralization was, though less pronounced, analogously found in the response-locked data, supporting the notion that it provides a spatial “response template” under spatially specific task demands. In contrast, no alpha asymmetry was evident in sound detection trials. Taken together, we find a substantial overlap between the mechanisms of attentional selection in perceptual and mnemonic auditory space. Importantly, alpha lateralization was limited to task demands requiring a spatially-specific response.

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NOTIZEN:

**67 Hemispheric alpha power asymmetries indicate selective forgetting in a retro-cuing paradigm**Barth, Anna<sup>1</sup>; Hickey, Clayton<sup>2</sup>; Wascher, Edmund<sup>1</sup>; Schneider, Daniel<sup>1</sup><sup>1</sup>Leibniz-Institut für Arbeitsforschung an der TU Dortmund (IfADo), Deutschland; <sup>2</sup>Center for Mind/Brain Sciences (CiMeC), University of Trento

Similar to visual perception, attention can be focused on relevant representations within working memory to ensure adequate behavioral performance. So-called retro-cuing paradigms have been established for investigating those attentional shifts within working memory. It has been suggested that retro-cues benefit the focus of working memory resources on a subset of representations, improving storage and retrieval at the cost of non-cued items. However, the contribution of target enhancement versus active inhibition of distractors (i.e. ‘selective forgetting’) to these mechanisms is rather unclear. Here, we present EEG data which allowed the dissociation of lateralized effects associated particularly with the processing of targets versus distractors in a retro-cuing paradigm. Therefore, we made use of retro-cues indicating a shift of attention to either a lateralized or non-lateralized memory item. Posterior alpha power was increased contralateral compared to ipsilateral to the irrelevant item when a non-lateralized mental representation was cued (‘distractor lateralized’ condition). Accordingly, a relative contralateral suppression of posterior alpha power was observed when a lateralized item had to be selected (‘target lateralized’ condition). This suggests that both the selective forgetting of the non-cued item and enhancement of the target representation are important features of attentional orienting within working memory. By further presenting cues to either remember or to forget a working memory representation, we give a first insight into these retroactive attentional processes as two distinct cognitive mechanisms.

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NOTIZEN:

**68** Does concurrent glucocorticoid and noradrenergic activity shift remembering from cognitive to habitual control?

Zerbes, Gundula<sup>1</sup>; Kausche, Franziska M.<sup>1</sup>; Müller, J. Christina<sup>2</sup>; Wiedemann, Klaus<sup>2</sup>; Schwabe, Lars<sup>1</sup>

<sup>1</sup>Universität Hamburg, Deutschland; <sup>2</sup>Universitätsklinikum Hamburg-Eppendorf, Deutschland

Memory is not a single entity but rather consists of multiple anatomically and functionally distinct systems. In particular, a cognitive or explicit system depending on the hippocampus can be distinguished from a habitual or implicit system governed by the dorsal striatum. It has been shown that stress favors habitual learning over cognitive learning, presumably through the action of glucocorticoids and noradrenaline. The current study tests whether the pharmacological increase of glucocorticoid and noradrenergic activity may also affect the nature of remembering, i.e. the system that controls memory retrieval. We expect that the combined activity of glucocorticoids and noradrenaline favors habitual over cognitive memory retrieval.

To test this hypothesis, participants performed a feedback-based Probabilistic Classification Learning (PCL) task that can be acquired by both the hippocampus based cognitive and the dorsal striatum based habit system. Twenty-four hours later, participants received either hydrocortisone, yohimbine leading to increased noradrenergic stimulation, both drugs, or a placebo. Afterwards, they completed the recall phase of the PCL task without feedback to exclude further learning. During this test phase, the memory system that guided retrieval was assessed.

Data are currently being analyzed and will be presented at the meeting.

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NOTIZEN:

**69** A new graph-based paradigm for measuring associative memory consolidation during sleep

Feld, Gordon; Bernard, Matthieu; Spiers, Hugo

University College London, Vereinigtes Königreich

Sleep has been repeatedly shown to improve the retention of memories. Declarative memory traces encoded into the fast-learning circuits of the hippocampus during wakefulness are replayed during subsequent sleep leading to sleep-dependent memory consolidation. Paired associate learning, especially, of word-pairs has often been used to identify the specific processes that actively strengthen memory traces during sleep. Although, this paradigm is highly sensitive to manipulations of sleep, it only has limited complexity and low external validity. In the present research, we attempted to establish a more complex associative learning task. Twenty-five men learned the associations between 27 picture stimuli by trial and error in a 3-alternatives-forced-choice task. Unknown to the participants all stimuli were associated within a graph network. After a retention period filled with either night-time sleep or daytime wakefulness, retrieval was tested by showing each possible combination of two pictures and asking whether they were associated during learning. Participants performed better, if they slept in the retention interval. This graph-based paradigm offers a new more complex test of declarative memory consolidation during sleep, while still offering good standardisation.

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NOTIZEN:

**70 The impact of acute stress on working memory and response inhibition**

Noack, Hannes<sup>1</sup>; Nolte, Leandra<sup>2</sup>; Skoluda, Nadine<sup>3</sup>; Nieratschker, Vanessa<sup>1</sup>; Habel, Ute<sup>2</sup>; Derntl, Birgit<sup>1</sup>

<sup>1</sup>Universität Tübingen, Deutschland; <sup>2</sup>RWTH Aachen, Deutschland; <sup>3</sup>Universität Wien, Österreich

Despite extensive research, the exact impact of acute stress on cognitive performance is still undetermined: positive as well as adverse effects on different cognitive processes (e.g. executive control functions) have been reported using different stress induction methods. Besides the methodological heterogeneity, strong interindividual differences in the response to stress are prevalent, which have recently been attributed to the presence or absence of early life adversities – among other factors.

In the present study we compared the impact of two different stress induction methods (ScanStress and the Maastricht Stress Test; MAST) on two different cognitive processes: working memory (n-back) and response inhibition (stop-signal). In total 160 healthy young males were tested at two different locations (Tübingen, Aachen). Compared to the corresponding placebo conditions, both stress induction methods were effective in terms of inducing stronger subjective stress experience and higher physiological measures of stress (saliva cortisol levels and heart rate). At the level of cognitive performance, however, only a trend for decreased n-back performance under stress was observed. No such effects were observed on response inhibition.

Our results are in line with previous meta-analytic results suggesting a weak detrimental effect of acute stress on working memory performance but no effect on response inhibition. Here we further characterized the pattern of interindividual differences in the stress response by looking at its associations with early life adversities, life stressors, and current levels of anxiety

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NOTIZEN:



**71** **Age-related decreases in the retrieval practice effect directly relate to changes in alpha-beta oscillations**Guran, C.-N. Alexandrina<sup>1</sup>; Herweg, Nora A.<sup>2</sup>; Bunzeck, Nico<sup>1</sup><sup>1</sup>Universität zu Lübeck, Deutschland; <sup>2</sup>University of Pennsylvania, USA

The retrieval (or testing) of information leads to better memory performance as compared to re-encoding. This phenomenon is known as ‘testing effect’ or ‘retrieval practice effect’ and has been described in several studies using various stimulus material. The underlying neural mechanisms, however, remain unclear. To address this issue, we used a previously established paradigm in healthy young (N = 27) and elderly (N = 28) participants while their brain activity was being recorded using electroencephalography (EEG). Subjects viewed pre-familiarized scene images intermixed with new scenes and classified them as indoor vs outdoor (encoding task) or old vs new (retrieval task). Subsequently, subjects performed a final recognition memory task. As expected, both young and elderly showed the testing effect but it was less pronounced in the elderly. At the neural level, the retrieval task was, as compared to the encoding task, accompanied by power decreases in the alpha (8-12 Hz) and beta bands (13-20 Hz), and this difference was more pronounced in the elderly. In line with this observation, those elderly who displayed a more pronounced testing effect exhibited a neural pattern that was more similar to the younger subjects. Our findings provide further evidence that the testing effect decreases across the life span, and they suggest that changes in alpha-beta oscillations play a direct role.

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NOTIZEN

**72** Frequency content of a single epoch P300 signal during an oddball paradigm or a d2-concentration test (combination of quantitative EEG and eye tracking).Dimpfel, Wilfried<sup>1</sup>; Schombert, Leonie<sup>2</sup><sup>1</sup>Justus-Liebig-Universität Giessen c/o NeuroCode AG Wetzlar, Deutschland; <sup>2</sup>NeuroCode AG, 35578 Wetzlar, Deutschland

Quantitative electroencephalography has provided a number of biomarkers, among them the so-called P300. This electric response of the brain has been related to memory retrieval. It can be measured by presenting acoustic or visual stimuli of two types, a frequent one and a seldom one, like O (80%) and X (20%). The subject has to count the number of seldom stimuli. Since the signal amplitude is small, about 120 triggered stimuli have to be presented. Averaging of the data reveals a reproducible positive response at about 300 ms after the trigger. Due to a newly developed EEG software, single epochs of 364 ms can now be analyzed quantitatively by Fast Fourier Transformation (FFT). By combination with eye tracking analysis it became possible to follow single acoustic or visual stimuli successfully epoch-wise throughout several minutes. Under this experimental condition the frequency content of a single epoch P300 becomes visible. Our results indicate that the single epoch P300 is characterized by a huge increase of alpha1 and alpha2 spectral power at the electrode position Pz. For the first time it became obvious that also other brain areas like the frontal brain are also involved during generation of the P300 response. Single epoch P300 analysis during performance of the d2-concentration test also revealed a similar pattern of huge increases of alpha spectral power at the electrode position Pz. In summary, combination of a fast dynamic quantitative EEG analysis with eye tracking allows for determination of the frequency content of single electric brain responses.

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NOTIZEN:

**73** Connectivity changes after TMS over the angular gyrus during task and rest

Jargow, Janine; Zwosta, Katharina; Korb, Franziska M.; Ruge, Hannes; Wolfensteller, Uta

Technische Universität Dresden, Deutschland

Repetitive transcranial magnetic stimulation (rTMS) is used to modulate excitability of specific brain regions and influence their function in behavioural tasks. Specifically, low-frequency rTMS is thought to inhibit cortical excitability for a certain amount of time. To date, few studies have used fMRI after TMS to evaluate its effects on task-related activation and functional connectivity of the stimulated area.

We investigated the influence of right angular gyrus (rAG) TMS on connectivity as measured by fMRI. To this end, 1Hz rTMS was applied to 20 right-handed participants (9 male) for 20 minutes over the rAG and vertex (control condition). Shortly after stimulation subjects underwent fMRI both while performing a spatial Simon task and at rest.

Interestingly, we found no stimulation effects on task-related brain-activation and functional connectivity of the rAG. Instead, we found connectivity changes in the task residuals, which were stable over task and baseline blocks, suggesting TMS effects that are independent from task events. A reduction in functional connectivity after TMS was observed only between the right and the left AG. Additionally, TMS resulted in increased functional connectivity between the rAG and several other brain regions including SMA, dorsal premotor cortex and middle temporal gyrus, which might reflect a compensatory mechanism. Finally, during the subsequent resting state MRI other brain areas including ACC, PCC, insular cortex as well as supramarginal and parahippocampal gyri showed an increased connectivity with the rAG. Taken together, these results suggest rather complex, context-specific effects of rTMS on functional connectivity of the stimulated area.

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NOTIZEN:

**74** **Neuronal activation in reading encodes semantic characteristics of predictable words prior to presentation**Eisenhauer, Susanne<sup>1</sup>; Fiebach, Christian J.<sup>1,2</sup>; Gagl, Benjamin<sup>1,2</sup><sup>1</sup>Goethe University Frankfurt, Germany; <sup>2</sup>Center for Individual Development and Adaptive Education of Children at Risk, Frankfurt, Germany

Visual word recognition is facilitated through predictive text context, resulting in fast reading times and reduced neuronal activation. Conceptually, this facilitation can be reconciled with theories such as predictive coding proposing increased neuronal processing efficiency by a proactive use of prior information to predict upcoming inputs. Crucial to these theories is the assumption that pre-stimulus neuronal activation patterns encode predictable stimulus characteristics, which was indeed found for low-level visual inputs. In visual word recognition the major goal is extracting meaning from letter strings. Thus, for predictable words semantic but also orthographic information might be encoded prior to stimulus onset. This prediction is tested here. We used a repetition priming task and realized high predictability of letter string characteristics by a high probability of identical prime-target pairings (75%). To assess neuronal activation MEG was recorded simultaneously (N=34). We expected that the information provided by the prime (i.e. word semantic) is encoded in the neuronal signal prior to target presentation. Time-generalized classification analyses were performed to differentiate semantic (words vs. pseudowords) as well as orthographic characteristics (orthographically familiarized vs. unfamiliar pseudowords). We found that activation prior to target presentation encoded semantic but not orthographic information. This indicates proactive encoding of semantic information in predictions of upcoming words to facilitate word recognition. In sum, our finding is in line with theories such as predictive coding suggesting a proactive prediction of future stimuli based on prior information.

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NOTIZEN:

**75 The Effect of Choice and Embarrassment on the Behavioral and Autonomic Correlates of Deception**

Suchotzki, Kristina; Gamer, Matthias

University of Würzburg, Deutschland

Previous research investigating deception has often used relatively neutral questions and instructed participants when to lie and when to tell the truth. Studies using more emotional or embarrassing questions and/or giving participants the choice to decide themselves when to tell the truth and when to lie are scarce and their results inconsistent. In the current study (n=47) we aimed to investigate the impact of those two practically relevant factors on the behavioral (i.e., reaction times) and autonomic (i.e., skin conductance responses and heart rate changes) correlates of deception. To that means, we used a Sheffield Lie Test, in which participants were either instructed by a color cue when to lie and when to tell the truth or could decide freely. We used both relatively neutral questions (e.g., “Have you ever been to the cinema?”) as well as more embarrassing ones (e.g., “Did you ever fake an orgasm?”). Results replicated previously found longer reaction times and stronger skin conductance responses for lying compared to truth telling. Those differences were, however, only present in the condition in which deception was instructed and not when deception was freely chosen. Effects were less clear in the heart rate changes. No interaction of question type with deception was observed. Those results are interesting as they implicate crucial differences between instructed and freely chosen deception, with the latter being more ecologically valid yet at the same time leading to a disappearance of typically observed behavioral and physiological differences between lying and truth telling.

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NOTIZEN:

**76 Acute psychosocial stress and everyday moral decision-making in young healthy men: The impact of cortisol**

Singer, Nina<sup>1</sup>; Sommer, Monika<sup>2</sup>; Döhnel, Katrin<sup>2</sup>; Zänkert, Sandra<sup>1</sup>; Wüst, Stefan<sup>1</sup>; Kudielka, Brigitte M.<sup>1</sup>

<sup>1</sup>Department of Medical Psychology, Psychological Diagnostics and Research Methodology, University of Regensburg, Germany; <sup>2</sup>Department of Psychiatry and Psychotherapy, University of Regensburg, Germany

In everyday life, moral decisions must frequently be made under acute stress. Although there is increasing evidence that both stress and cortisol affect moral judgment and behavior as well as decision-making in various domains unrelated to morality, surprisingly few attempts have been made to explore the effects of stress on everyday moral decision-making. Therefore, in the present study, we exposed 50 young healthy men to the Trier Social Stress Test (TSST) or its non-stressful placebo version (PTSST). We investigated the impact of acute stress exposure and stress-related cortisol levels on decision-making, decision certainty, and emotions in 28 everyday moral conflict situations with altruistic versus egoistic response alternatives. Results showed that the TSST-exposed group made more altruistic decisions than the non-stress control group, while groups did not differ in decision certainty and emotion ratings. Moreover, in correlational as well as regression analyses, additionally controlling for confounding variables, we observed significant positive associations between cortisol levels and altruistic decision-making. Further analyses revealed that altruistic decisions came along with significantly higher decision certainty and significantly more positive emotion ratings than egoistic decisions. Notably, our data also raise the idea that the personality trait agreeableness plays an important role in everyday moral decision-making. In sum, our findings provide initial evidence that both acute stress exposure and cortisol levels have prosocial effects on everyday moral decision-making in young healthy men.

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NOTIZEN:

**77 Oxytocin enhances the pain-relieving effects of social support in romantic couples**

Kreuder, Ann-Kathrin<sup>1</sup>; Wassermann, Lea<sup>1</sup>; Wollseifer, Michael<sup>1</sup>; Ditzen, Beate<sup>2</sup>; Eckstein, Monika<sup>2</sup>; Stoffel-Wagner, Birgit<sup>3</sup>; Hennig, Jürgen<sup>4</sup>; Hurlmann, René<sup>1,5</sup>; Scheele, Dirk<sup>1</sup>

<sup>1</sup>Division of Medical Psychology, University of Bonn, Germany; <sup>2</sup>Institute of Medical Psychology, Center for Psychosocial Medicine, Heidelberg University, Germany; <sup>3</sup>Department of Clinical Chemistry and Clinical Pharmacology, University of Bonn, Germany; <sup>4</sup>Division of Personality Psychology and Individual Differences, University of Giessen, Germany; <sup>5</sup>Department of Psychiatry, University of Bonn, Germany

Social support plays a vital role in physical and mental well-being. The comforting touch of a loved one has strong anti-nociceptive effects, but the neurobiological substrates that mediate bonding-specific pain relief remain elusive. In the present randomized placebo-controlled, between-group, functional magnetic resonance imaging study involving 194 healthy volunteers (97 heterosexual couples), we tested the effects of the hypothalamic peptide oxytocin (OXT; 24 IU) on handholding as a common mode of expressing emotional support in romantic couples. We scanned the subjects while brief electric shocks were administered. The subjects assumed that they received no support or social support from either their romantic partner or an unfamiliar person. Partner support was most effective in reducing the unpleasantness of electric shocks, and OXT further attenuated the unpleasantness across conditions. On the neural level, OXT significantly augmented the beneficial effects of partner support, as evidenced by a stronger decrease of neural responses to shocks in the anterior insula (AI), a stronger activity increase in the middle frontal gyrus (MFG), and a strengthened functional coupling between the AI and MFG. Collectively, our results support the notion that OXT specifically modulates the beneficial effects of social support in romantic couples by concomitantly reducing pain-associated activity and increasing activity linked to cognitive control and pain inhibition. We hypothesize that impaired OXT signaling may contribute to the experience a lack of partner support.

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NOTIZEN:

**78 Social anxiety modulates visual exploration in real life – but not in the laboratory**

Rubo, Marius; Gamer, Matthias

Universität Würzburg, Deutschland

Socially anxious persons are often described to avoid gaze at other persons in every-day situations. However, several studies did not find a modulation of gaze behavior by social anxiety when employing images of persons, or found effects reversed to clinical observations. The present study investigates gaze behavior in persons with varying degrees of social anxiety symptoms both in a real-life and a matched laboratory condition, resolving discrepancies in the different methodologies previously used. Sixty participants either walked in a real social situation or viewed the same scene on a monitor while their gaze was tracked. Persons high on social anxiety avoided looking at close compared to distant persons in the real situation. On the contrary, gaze behavior in the laboratory condition was not modulated by social anxiety. We conclude that the complete absence of effects of social anxiety on gaze behavior in the matched laboratory condition points to critical deficits in current laboratory research paradigms in eliciting authentic attentional mechanisms, possibly leading to spurious results.

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NOTIZEN:



**79 Dopaminergic and schizophrenia risk genes are related to activation in Brodmann area 44 and amygdala during social cognition**

Schmidt, Stephanie; Yan, Zhimin; Hass, Joachim; Kirsch, Peter; Mier, Daniela

Zentralinstitut für seelische Gesundheit, Deutschland

Several neurotransmitters, particularly oxytocin and serotonin, have been linked to social cognition. Interestingly however, the influence of dopamine on social-cognitive processes has not been thoroughly investigated, even though anomalies in both the dopaminergic system and in social cognition are present in various mental disorders, with schizophrenia leading the way. With our imaging genetics study, we want to analyze the influence of a dopaminergic single nucleotide polymorphism (SNP), as well as a SNP linked to risk for schizophrenia on brain activation during social cognitive tasks.

74 healthy participants completed a social-cognitive task, including face processing (FP), emotion recognition (ER), Theory of Mind (ToM), and a non-social control (NSC) during an fMRI-measurement. Additionally, we determined participants' variants of rs4680 (COMT) that is relevant for the dopaminergic system, and of rs1344706 (ZNF804A) that has been linked to schizophrenia.

During ER compared to NSC, the T-allele of rs1344706 was related to reduced BA44 and higher amygdala activation. The Met-allele of rs4680 was linked to higher amygdala activation both during ER versus NSC and during ToM versus NSC.

Our results indicate how SNPs related to dopamine levels and schizophrenia risk are linked to activation in regions for face- and emotion-processing. Further, the link to activation in BA44 could reflect an involvement of the mirror neuron system that is assumed to enable us to understand others' emotions. These findings could help to better understand the neurobiological basis of social cognition, and might enhance our knowledge on social-cognitive deficits in mental disorders, such as schizophrenia.

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NOTIZEN:

**80** **The effect of multiple factors defining group membership on interpersonal interactions: an fMRI study**

Neziroglu, Gizem; Steines, Miriam; Kircher, Tilo; Straube, Benjamin

Department of Psychiatry and Psychotherapy, Philipps University of Marburg

Inferring mental states of others – defined as theory of mind (ToM) - is known to be influenced by the group membership (e.g., fan of a preferred sports club) of the person we are interacting with. Despite extensive evidence on the neural underpinnings of ToM, the interplay between multiple factors defining group membership in interpersonal interactions is unknown. The aim of this study was to investigate how neural correlates of social interactions are influenced by group membership defined by cues representing ethnic and artificial groups. We first created artificial groups using a minimal group paradigm in which group membership was generated by a bogus problem solving test (minimal in- vs. out-group). In a 3T MRI scanner, German participants then played a modified version of the Prisoner's Dilemma Game with alleged members of their in-group or out-group. In addition, the game partner could be of either German or Turkish descent (ethnic in- vs. out-group). Preliminary results indicate that interacting with a game partner significantly activated the ToM network across all conditions (in-groups and out-groups). Interacting with a member of both the minimal and the ethnic out-group led to bilateral amygdala activation, resulting in a linear increase across conditions (in-group/in-group to out-group/out-group). These results point to an enhanced affective processing when interacting with out-group members independent of factors defining the group membership (ethnicity vs. minimal group).

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NOTIZEN

**81 How Culture and Novel Team-Memberships Affect Face Processing: A Functional Magnetic Resonance Imaging Investigation**

Yan, Zhimin; Schmidt, Stephanie; Saur, Sebastian; Kirsch, Peter; Mier, Daniela

Central Institute of Mental Health, Germany

Intracultural advantage refers to the phenomenon that people are faster in recognizing and better in understanding members of their own culture compared to those of another culture. Recent studies found that the intracultural advantage can be reduced by a novel in-team bias caused by the membership in a mixed-race group. The present study was conducted to investigate the neural mechanism of overwriting the intracultural bias by a novel in-team bias, and to examine its possible cultural differences between collectivism and individualism.

48 participants (23 Chinese and 25 Germans) were randomly assigned to one of two different mixed-race teams and learned the team membership of Asian and Caucasian faces. Afterwards they completed a cultural categorization-fMRI task in which they had to categorize the Asian and Caucasian faces according to their culture or their team memberships.

Participants were faster to categorize in-culture compared to in-team members. On the neural level, the faster processing of in-culture categorizations was reflected in increased activation in the default mode network and the temporal lobe. Further, compared to Chinese, Germans participants showed less deactivation in the medial frontal cortex for in-culture than for in-team categorizations.

The faster reaction times along with the enhanced activation in regions of the default mode system indicate that it is easier to categorize in-culture members than in-team members according to their mixed-race team. The reduced deactivation in medial frontal cortex might suggest that people with an individualistic compared to those with a collectivistic background are more easily involved in a novel group.

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NOTIZEN

**82 Developmental neuroscience of attachment: fMRI correlates of processing social separation in 9-11 year old children**

Schött, Margerete<sup>1,2</sup>; Degen, Tom<sup>2</sup>; Leuzinger-Bohleber em., Marianne<sup>2,4</sup>; Fischmann, Tamara<sup>2,3</sup>; Fiebach, Christian J.<sup>1</sup>

<sup>1</sup>Goethe Universität Frankfurt; <sup>2</sup>Sigmund-Freud-Institut Frankfurt; <sup>3</sup>International Psychoanalytic University, Berlin; <sup>4</sup>Universität Kassel

Early attachment experiences are essential for the cognitive, affective, and social development of children. Attachment theory postulates an ‘attachment-system’ that triggers behavioral mechanisms to enhance safety in situations of threat, e.g. by increasing proximity to the caregiver. The neural mechanisms underlying the development of this system, however, are so far only poorly understood. From 8 years on, verbal representations of individual attachment-style can be assessed with attachment measures, e.g. using interviews. We developed an fMRI-suitable paradigm, based on projective attachment assessments, to trigger attachment related coping mechanisms. In this paradigm, the “Passive Separation Anxiety Task for Children” (PSAT), images of attachment-related vs. neutral situations are presented together with auditory descriptions of the respective situations. After each trial, participants provide a subjective rating of stimulus valence using the Self-Assessment Manikin. Functional MRI (3Tesla) was measured while N=20 children (9-11 years) completed the PSAT. Behaviorally, attachment-related stimuli were rated as more negative than neutral stimuli. We observed significantly increased activation for attachment-related relative to neutral stimuli in key regions of the default mode network (DMN), including the medial prefrontal cortex, precuneus, superior and middle temporal gyrus, angular gyrus, the temporo-parietal junction, and hippocampus. The DMN has been associated with cognitive and affective mentalization processes, self-reference, as well as reflecting upon others. Our preliminary results thus point to an increased involvement of reflexive processes in attachment-related as opposed to neutral social situations. Group comparisons of children with different attachment styles will give insight into inter-individual differences in respect to the individual attachment style.

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NOTIZEN

## 2 Freitag, 01.06.2018

### 2.1 Symposienblock III: 09:00-10:30 Uhr

#### 2.1.1 Erotik in der Psychologie: Von den Grundlagen zur klinischen Anwendung [Hörsaal A1]

Jana Strahler, Justus-Liebig-Universität Gießen  
Birgit Derntl, Universitätsklinikum Tübingen

Erotik, sexuelle Lust und Phantasie spielen eine wichtige Rolle in unserem Leben. Lustempfinden und das Verlangen nach Sexualität können im Rahmen von psychischen Erkrankungen jedoch erheblich beeinträchtigt sein. Um hier (dys)funktionale Vorgänge besser zu verstehen, bedarf es der Untersuchung basaler Wahrnehmungsprozesse unter Verwendung validen Stimulusmaterials und robuster Untersuchungsmethoden. Dieses Symposium betrachtet daher aktuelle Ansätze zur Untersuchung von erotischem Stimulusmaterial aus unterschiedlichen Blickwinkeln und stellt verschiedene Einflussfaktoren vor.

Im ersten Beitrag (Johannes Finke, Trier) werden basale Wahrnehmungsprozesse visueller sexueller Reize (erotische bis pornografische Akt- und Paarbilder) anhand von evozierten Pupillenreaktionen vorgestellt. Dieser Beitrag wird auch Hinweise auf potentielle Geschlechterunterschiede sowie Effekte von sympathischer Aktivierung und Stress geben. Auch ist anzunehmen, dass sich der Geschlechtshormonspiegel auf die sexuelle Lust und die Wahrnehmung erotischer Stimuli niederschlägt. So wird im zweiten Beitrag (Aisha Munk, Gießen) mittels EEG die neuronale Reaktivität auf erotische Wörter sowie auf Bilder über den Menstruationszyklus natürlich-zyklischer Frauen hinweg untersucht. Beitrag drei (Ann-Christin Kimmig, Tübingen) ergänzt diese Befunde, stellt zunächst ein neu entwickeltes erotisches Stimulus-Set für heterosexuelle Frauen vor und beschreibt im Anschluss Daten zum Einfluss endogener vs. synthetischer Geschlechtshormone auf sexuelles Annäherungsvermeidungsverhalten gemessen mittels erotischem Approach-Avoidance-Task. Um schließlich noch den Bogen zur klinischen Anwendung zu schlagen, untersucht der vierte Beitrag (Ann-Kathrin Noll, Gießen) depressive Patientinnen ebenfalls mittels erotischer Varianten der Approach-Avoidance-Task, dem dot-probe Paradigma und einer Aufmerksamkeitsinterferenzaufgabe.

Die präsentierten Ergebnisse erweitern unser Verständnis zu potentiellen Veränderungen der Wahrnehmung erotischen Stimulusmaterials in Abhängigkeit von Geschlecht, Hormonspiegel und Psychopathologie und ermöglichen so längerfristig auch die Translation von den Grundlagen zur klinischen An-

wendung.

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NOTIZEN

## **Pupillenreaktionen als Index für die basale Verarbeitung von Erotika**

Finke, Johannes

Universität Trier, Deutschland

Die Dilatation der Pupille bei der Wahrnehmung erotischer Bilder ist ein seit langem bekanntes Phänomen. Der vorliegende Beitrag stellt einige methodologische Weiterentwicklungen vor, die evozierte Pupillenreaktionen als implizites Maß für die schnelle Verarbeitung sexuell erregenden Stimulusmaterials geeignet erscheinen lassen, und integriert mithin die Befunde dreier unabhängiger Studien, in denen Reaktionen auf erotische Akt- und Paarbilder mit denen auf neutrale (sowie gewalthaltige) soziale Situationen verglichen wurden. Dabei wurden visuelle Stimuli jeweils für 2500ms im zentralen visuellen Feld präsentiert und Pupillenreaktionen infolge der Kontrolle physikalischer Parameter ohne Auslösung des initialen Lichtreflexes der Pupille aufgezeichnet, was ihre Zerlegung in eine frühe, wahrscheinlich durch parasympathische Inhibition bedingte Komponente (Maximum 500 ms nach Stimulusonset) und eine spätere, durch direkte sympathische Aktivierung bestimmte Komponente (mit höherem Varianzanteil) ermöglicht. Studie 1 (N = 35) zeigt, dass die späte Reaktionsphase ein geschlechtsabhängiges Muster aufweist, gekennzeichnet durch stärker kategorienspezifische Reaktionen männlicher Teilnehmer, analog zu Hautleitfähigkeitsreaktionen und subjektiven Bewertungen, wohingegen die frühe Komponente auf geschlechterübergreifend übereinstimmende Prozesse der automatisierten Verarbeitung visueller sexueller Reize hindeutet. Im Vergleich mit anderen emotionalen Stimuluskategorien (Studie 2, N = 38) weist die frühe Phase der Dilatation interessanterweise auch die größte Spezifität für erotische Bilder auf. Die Ergebnisse von Studie 3 (N = 56) legen weiterhin nahe, dass vorangegangene Stressexposition die Reagibilität auf explizite Erotika kurzfristig erhöht (möglicherweise insbesondere durch sympathische Prozesse vermittelt), während der Cortisolanstieg unter akutem Stress mit einer verminderten Pupillenreaktion assoziiert zu sein scheint. Die Relevanz dieser Befunde im Hinblick auf die Unterscheidung automatischer versus kontrollierter Mechanismen der Verarbeitung erotischer Reize wird diskutiert.

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NOTIZEN:

## **Unterschiede in der Ansprechbarkeit auf erotische Reize im Late Positive Potential (LPP) und hormonelle Schwankungen während des Zyklus': Was steckt dahinter – Östradiol, Progesteron, oder doch Testosteron?**

Munk, Aisha Judith Leila; Hennig, Jürgen

JLU Gießen, Deutschland

Inwiefern spielen Sexualhormone bei der Reagibilität auf erotische und andere positiv emotionale Reize eine Rolle? Während sich viele Studien mit depressiver Symptomatik während der Zyklusphasen beschäftigen, ist die Forschung im Hinblick auf positive Psychologie in diesem Bereich – wenn überhaupt – nur sehr spärlich vorhanden.

In einer vorangegangenen Studie konnte bereits gezeigt werden, dass die Ansprechbarkeit auf erotische Wörter im Late Positive Potential (LPP) mit Östradiolkonzentrationen von frei zyklierenden Frauen während ihrer fruchtbaren Phasen assoziiert ist. In vorliegender Studie sollte nun untersucht werden, inwiefern sich diese Assoziation auch in Reaktion auf positiv emotionale und erotische Bilder (im Gegensatz zu Wörtern) zeigt, und ob Testosteron als Vorläufer von Östradiol hier nicht auch maßgeblich eine Rolle spielt.

Hierzu wurde bei 30 jungen Frauen (ohne Einnahme hormonelle Kontrazeptiva) zu drei Messzeitpunkten (jeweils während der Follikular-, Ovulations- und Lutealphase) ein Elektroenzephalogramm (EEG) abgeleitet, während sie ein abgewandeltes Stroop-Paradigma mit positiv emotionalen und erotischen Bildern bearbeiteten. Zu allen drei Zeitpunkten wurde Östradiol, Testosteron und Progesteron im Speichel gemessen. Hierbei wurde angenommen, dass sich eine Positivierung im LPP mit erhöhter Östradiolkonzentration auch auf erotische Bilder zeigt, während Progesteron nicht mit der Ansprechbarkeit auf erotische Bilder im LPP assoziiert ist. Ferner wurde überprüft, inwiefern die Testosteronkonzentration als Vorläufer von Östradiol relevant ist. Die Ergebnisse werden im Hinblick auf weitere Implikationen diskutiert.

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NOTIZEN:



## **Emotionale Hormone: Der Einfluss endogener vs. synthetischer Geschlechtshormone auf sexuelle Responsivität bei Frauen**

Kimmig, Ann-Christin Sophie<sup>1,2</sup>; Sundström Poromaa, Inger<sup>3</sup>; Brucker, Sara<sup>4</sup>; Derntl, Birgit<sup>1,5,6</sup>

<sup>1</sup>Abteilung für Psychiatrie und Psychotherapie, Univ. Tübingen, Deutschland; <sup>2</sup>International Max Planck Research School for Cognitive and Systems Neuroscience, Tübingen, Deutschland; <sup>3</sup>Department of Women's and Children's Health, Uppsala Univ., Schweden; <sup>4</sup>Abteilung für Gynäkologie und Geburtshilfe, Univ. Tübingen, Deutschland; <sup>5</sup>Werner Reichardt Centrum für Integrative Neurowissenschaften, Univ. Tübingen, Deutschland; <sup>6</sup>Lead Graduate School, Univ. Tübingen, Deutschland

Orale Kontrazeptiva (OK) werden von Millionen Frauen weltweit jeden Tag eingenommen. Daher ist verwunderlich, dass bislang nur wenig über die psychologischen und neurobiologischen Effekte der OK-Einnahme bekannt ist. Erste Studien weisen auf Veränderungen der Partnerwahl, dem sexuellen Verlangen und Erregung durch OK- Einnahme hin. Ob OK-Einnahme auch sexuelle Appetenz und damit einhergehend Annäherungs-Vermeidungsverhalten beeinflusst ist bislang unbekannt. Um solche Annäherungs-Vermeidungstendenzen zu erfassen, eignet sich ein erotischer ‚Approach-Avoidance Task‘ (AAT). Da bisher noch kein geeigneter AAT zum Erfassen von sexueller Appetenz speziell für heterosexuelle Frauen existiert, war das erste Ziel dieser Studie ein geeignetes Stimulus-Set zusammenzustellen und zu validieren. Hierzu wurden 252 Bilder von 1) Pärchen und 2) Männern in a) erotischen, b) positiven unerotischen und c) aversiven Szenen aus verschiedenen Bilderdatenbanken gesammelt. Diese wurden dann von 22 heterosexuellen Frauen anhand von fünf Skalen bewertet und die am eindeutigsten bewerteten Bilder für das Stimulus-Set ausgewählt. Um den Einfluss endogener vs. synthetischer Geschlechtshormone auf sexuelle Appetenz zu untersuchen, wird der AAT im Verhalten an drei Frauen-Gruppen erprobt: natürlich zyklische Frauen während 1) Menses oder 2) Ovulation und 3) Frauen, die OKs schon seit mindestens 12 Monaten einnehmen. Hierzu werden vorläufige Ergebnisse präsentiert.

Das Erstellen eines erotischen AAT's für heterosexuelle Frauen erlaubt es erstmals den Einfluss endogener vs. synthetischer Geschlechtshormone auf sexuelle Appetenz und Annäherungs- /Vermeidungsverhalten zu untersuchen. Neben den Einflüssen auf Partnerpräferenz und sexuelle Lust, könnten potentielle Veränderungen des tatsächlichen Annäherungs-/Vermeidungsverhalten auf Männer durch OK-Einnahme weitreichende individuelle und gesellschaft-

liche Konsequenzen haben.

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NOTIZEN

## **Sexuelle Responsivität auf sexuelle Reize bei depressiven Frauen**

Noll, Ann-Kathrin; Baranowski, Andreas; Strahler, Jana; Stark, Rudolf

Justus-Liebig-Universität Gießen, Deutschland

Sexuelle Reize sind evolutionsbiologisch bedeutsame appetitive Reize, die Aufmerksamkeit auf sich ziehen. Ein zentrales Kennzeichen von Depression ist Anhedonie und häufig klagen depressive Menschen über einen Libidoverlust. Sexuelle Dysfunktionen im Rahmen einer Depression stellen nicht nur eine zusätzliche Belastung dar, sondern wirken sich auch ungünstig auf Selbstbewusstsein, Lebensqualität und die Beziehung zum Sexualpartner aus, wodurch die Ressourcen der Betroffenen weiter geschwächt und die Depression verschlimmert werden. Eine mögliche Ursache dieser sexuellen Beeinträchtigungen liegt möglicherweise in der Wahrnehmung sexueller Reize. Theoretische Modelle zur Informationsverarbeitung postulieren, dass sich die sexuelle Erregung einer Person umso leichter steigert, je mehr Aufmerksamkeit diese Person auf sexuelle Reize richtet. Es stellt sich die Frage, ob basale Aufmerksamkeits- und Annäherungstendenzen auf sexuelle Reize, die z.T. nicht willentlich beeinflussbar sind, bei depressiven Personen verändert sind. Da sexuelle Reize generell als positive Reize bewertet werden, wird analog zu den Erkenntnissen bezüglich der bei depressiven Personen veränderten Wahrnehmung positiver Reize davon ausgegangen, dass Depressivität einhergeht mit verringerter Aufmerksamkeitszuwendung, Aufmerksamkeitsinterferenz und Annäherungstendenz zu sexuellen Reizen.

In einer Studie wurden 25 Frauen mit und 25 Frauen ohne Depressionssymptomatik in drei Verhaltensexperimenten untersucht: Neben einem Dot-Probe Paradigma zur Messung der Aufmerksamkeitszuwendung, wurde eine Aufmerksamkeitsinterferenzaufgabe und ein Approach Avoidance Task durchgeführt. Dabei wurden visuelle sexuelle Reize, die in Vorstudien als sexuell erregend eingeschätzt wurden, mit neutralen Reizen verglichen. Die Ergebnisse und insbesondere die Gemeinsamkeiten und Unterschiede zwischen den drei Untersuchungsparadigmen werden in der Präsentation vorgestellt und diskutiert.

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NOTIZEN:

### 2.1.2 Kognition, Altern und Neurodegeneration: Multimethodale Ansätze[Hörsaal A2]

Sebastian Markett, Humboldt Universität zu Berlin

Martin Reuter, Universität Bonn

Neurodegenerative Erkrankungen und Demenzen stellen eine große gesundheitliche und gesellschaftliche Herausforderung dar. Aufgrund demographischer Entwicklungen kann davon ausgegangen werden, dass die Herausforderungen in Zukunft noch gravierender sein werden. Die Pathogenese von Demenzerkrankungen beginnt nicht erst im höheren Lebensalter. Distale Risikofaktoren, zum Beispiel in Form von genetischer Variation, führen schon im jungen Erwachsenenalter zu messbaren Veränderungen auf neuronaler Ebene. Darüber hinaus treten auch bei gesundem Altern kognitive und neuronale Veränderungen auf, deren Verlauf und Mechanismen bekannt sein müssen, wenn pathologische Veränderungen im Rahmen von neurodegenerativen Erkrankungen evaluiert werden sollen. Außerdem müssen pathologische Veränderungen genauer charakterisiert werden und auf mögliche therapeutische Modifizierbarkeit untersucht werden.

Forschungsstrategien sollten daher eine Lebensspannen-Perspektive einnehmen und aufgrund der Vielzahl von Betrachtungsebenen multimethodale Ansätze beinhalten. In unserem Symposium präsentieren fünf Vortragende von vier Universitäten ihre aktuellen Arbeiten zu Kognition, Altern und Neurodegeneration. In den vorgestellten Projekten werden a) genetische Risikofaktoren für die Alzheimer-Erkrankung bei jungen Probandinnen und Probanden in genetischen Imaging-Studien untersucht (Nadja Deris, Anne Bierbrauer), b) Effekte von randomisierten Interventionsstrategien bei Mild Cognitive Impairment auf epigenetischer und behavioraler Ebene evaluiert (Martin Reuter), c) Zusammenhänge zwischen Oszillationen im evokierten EEG und hirnstrukturellen Veränderungen im dopaminergen System von älteren Probandinnen und Probanden aufgezeigt (Nico Bunzeck), sowie d) netzwerk-topologische Aspekte der Atrophierung und Beta-Amyloid-Belastung bei der Alzheimer Erkrankung mittels Diffusions-Bildgebung, strukturellem MRT und Positron-Emissions-Tomographie untersucht (Sebastian Markett). Wir präsentieren damit aktuelle Entwicklungen in der biopsychologischen Alters- und Demenzforschung, die sich der Thematik aus einer kognitiv-neurowissenschaftlichen Lebensspannen-Perspektive annehmen.

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NOTIZEN

## Biologische Grundlagen von False Memories: Eine Genetic-Imaging-Studie unter Berücksichtigung des Alzheimer-relevanten ApoE- Polymorphismus

Deris, Nadja<sup>1</sup>; Markett, Sebastian<sup>2</sup>; Felten, Andrea<sup>1</sup>; Melchers, Martin<sup>1</sup>; Weber, Bernd<sup>3,4,5</sup>; Reuter, Martin<sup>1,3</sup>

<sup>1</sup>Universität Bonn, Deutschland; <sup>2</sup>Humboldt-Universität zu Berlin, Deutschland; <sup>3</sup>Center for Economics and Neuroscience, Universität Bonn, Deutschland; <sup>4</sup>Life and Brain Center, Universität Bonn, Deutschland; <sup>5</sup>Klinik für Epileptologie, Universitätsklinikum Bonn, Deutschland

Der stärkste genetische Risikofaktor für die Alzheimer-Erkrankung ist das  $\epsilon 4$ -Allel auf dem Apolipoprotein-E-Gen (ApoE). Vorangegangene Studien konnten zeigen, dass auch gesunde Personen mittleren Alters mit dem Risikoallel unterschiedliche Performanz und Hirnaktivität in kognitiven Aufgaben aufweisen. Um die Pathogenese der Alzheimer-Erkrankung besser zu verstehen und einen Beitrag zur Früherkennung leisten zu können, werden vermehrt Studien durchgeführt, die solche Unterschiede auch bei jungen Erwachsenen untersuchen. Ziel der vorliegenden Studie war es, Unterschiede in falschen Erinnerungen zwischen  $\epsilon 3/\epsilon 3$ - und  $\epsilon 3/\epsilon 4$ -Trägern zu untersuchen und deren neuronale Korrelate aufzudecken.

N=53 gesunde Probanden im Alter zwischen 18 und 30 Jahren bearbeiteten das Deese-Roediger-McDermott-Paradigma im MRT. Über alle Probanden hinweg zeigte sich eine stärkere Aktivierung des posterioren Parietallappens bei der korrekten Zurückweisung neuer Wörter, die semantisch mit den vorher gelernten assoziiert waren, als bei solchen, die nicht semantisch mit den gelernten Wörtern verwandt waren. Dieser Aktivierungsunterschied war bei  $\epsilon 3/\epsilon 3$ -Trägern stärker als bei  $\epsilon 3/\epsilon 4$ -Trägern. Zudem fand sich eine signifikante Interaktion zwischen ApoE-Genotyp und semantischer Assoziation zu den gelernten Wörtern auf die Anzahl falscher Erinnerungen.  $\epsilon 3/\epsilon 4$ -Träger wiesen mehr falsche Erinnerungen als  $\epsilon 3/\epsilon 3$ -Träger auf, wenn die Wörter semantisch mit den gelernten Wörtern assoziiert waren.

Sowohl die Ergebnisse der Verhaltensdaten als auch die der Aktivierungsdaten liefern Hinweise darauf, dass sich die Gedächtnisbildung zwischen  $\epsilon 3/\epsilon 3$ - und  $\epsilon 3/\epsilon 4$ -Trägern unterscheidet. Bei der Rekognition scheinen  $\epsilon 3/\epsilon 4$ -Träger (pathogener Risikofaktor) anfälliger für kritische Assoziationen zu sein. Dies wird in der Aktivierung des posterioren Parietallappens bei der korrekten Zurückweisung semantisch verwandter Wörter widergespiegelt.

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NOTIZEN

## Untersuchung von Pfadintegration in Abhängigkeit des APOE-Genotyps

Bierbrauer, Anne<sup>1</sup>; Kunz, Lukas<sup>2</sup>; Gomes, Carlos A.<sup>1</sup>; Axmacher, Nikolai<sup>1</sup>

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Das  $\epsilon 4$ -Allel des APOE-Gens ist der stärkste genetische Risikofaktor für die spät beginnende Form der Alzheimer Demenz (AD). Der entorhinale Kortex – eine der ersten Gehirnregionen, bei der pathologische Veränderungen durch AD festgestellt werden können – enthält sogenannte „grid cells“, welche möglicherweise das neuronale Substrat für Pfadintegration darstellen. Junge, gesunde Träger des APOE  $\epsilon 4$ -Allels zeigten in einer vorigen fMRT-Studie verminderte „grid cell“-Aktivität des entorhinalen Kortex im Vergleich zu APOE  $\epsilon 4$ -Nichtträgern (Kunz et al., 2015). Allerdings zeigten die APOE  $\epsilon 4$ -Träger keine offenkundigen behavioralen Beeinträchtigungen in der Navigationsaufgabe, was auf die Verwendung unterschiedlicher Navigationsstrategien zurückzuführen sein könnte. Wir stellen ein neues virtuelles Navigationsparadigma vor, das erlaubt, verschiedene Navigationsstrategien (reine Pfadintegration, durch räumliche Grenzen unterstützte Pfadintegration sowie durch räumliche Landmarken unterstützte Pfadintegration) von APOE  $\epsilon 4$ -Trägern und  $\epsilon 4$ -Nichtträgern in virtuellen Umgebungen zu untersuchen. Vorläufige Ergebnisse legen nahe, dass der APOE Genotyp die behaviorale Leistung in Abhängigkeit von der untersuchten Navigationsstrategie moduliert. Darüber hinaus zeigen fMRT-Ergebnisse mit dem gleichen Paradigma differentielle Aktivierungen in Abhängigkeit von der untersuchten Navigationsstrategie. Unsere vorläufigen Ergebnisse deuten darauf hin, dass die Untersuchung von Pfadintegration subtile Veränderungen der räumlichen Navigation in Probanden mit einem erhöhten genetischen Risiko für AD aufzudecken in der Lage ist.

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NOTIZEN

## **Effekte eines einjährigen Sportprogramms auf kognitive Funktionen und körperliche Fitness bei älteren Menschen mit kognitiven Einschränkungen (MCI) in Abhängigkeit von epigenetischen Veränderungen des BDNF-Gens**

Reuter, Martin<sup>1</sup>; Stuckenschneider, Tim<sup>2</sup>; Weber, Jan<sup>2</sup>; Schneider, Stefan<sup>2</sup>; Felten, Andrea<sup>1</sup>

<sup>1</sup>Institut für Psychologie, Differentielle & Biologische Psychologie, Universität Bonn; <sup>2</sup>Institut für Bewegungs- und Neurowissenschaft, Deutsche Sporthochschule Köln

Neurodegenerative Erkrankungen, insbesondere Demenzen, sind bedingt - durch den demographischen Wandel eine der größten Herausforderungen für die Neurowissenschaften. Neben Gedächtnistrainings und dem Einsatz von Nootropika erlangen sportliche Interventionen zunehmend an Bedeutung.

In einem internationalen EU-Projekt werden in drei Ländern (DE, NL und IRL) die Effekte eines einjährigen Sportprogramms auf kognitive Funktionen und körperliche Fitness bei N=225 älteren Menschen mit Vorstufen einer Alzheimer-Demenz untersucht. Die Probanden wurden randomisiert einer der drei experimentellen Bedingungen zugewiesen und erhielten wöchentlich drei Trainingseinheiten à 60 min (entweder aerobes Training oder stretching und toning) oder gehörten der Kontrollgruppe (kein Training) an.

Die Trainingseffekte wurden in Abhängigkeit von epigenetischen Veränderungen des BDNF-Gens untersucht. BDNF ist ein neurotropher Faktor, der entscheidenden Einfluss auf das Überleben und die Proliferation von Neuronen hat.

Bislang wurden durch extensive Methylierungsanalysen mittels Massenspektrometrie die CpG-Islands des BDNF-Gens in der deutschen Stichprobe untersucht, die bereits das einjährige Training absolviert hat. Die Ergebnisse zeigen in der deutschen Gesamtstichprobe einen zu erwartenden Rückgang der Methylierung über die Zeit. Dieser Effekt kann in den beiden Gruppen mit sportlicher Intervention unabhängig von der Trainingsintensität aufgehalten werden. Ferner steht ein geringerer Rückgang der Methylierung des BDNF-Gens in signifikantem Zusammenhang mit der Verbesserung der körperlichen Fitness. Epigenetische Effekte auf die kognitive Leistungsfähigkeit konnten jedoch nicht gezeigt werden.

Die Ergebnisse demonstrieren eindrucksvoll den Zusammenhang zwischen der positiven Wirkung einer strukturierten einjährigen Sport-Intervention im Feld und epigenetischen Veränderungen des BDNF-Gens.

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NOTIZEN

## **Die Integrität des dopaminergen Mittelhirns im Alter moduliert den Zusammenhang zwischen Motivation und neuronaler Theta-Oszillation**

Bunzeck, Nico

Universität zu Lübeck, Deutschland

Das dopaminerge mesolimbische System degeneriert im Alter und übt somit einen Einfluss auf verschiedene kognitive Funktionen aus. Um die zugrunde liegenden neuronalen Mechanismen genauer zu charakterisieren, wurde in dieser Studie EEG mit einem Belohnungsparadigma bei gesunden jungen und älteren Probanden genutzt. Dabei wurden Bilder von Szenen mit Hinweisreizen kombiniert, die entweder eine hohe oder niedrige Belohnung vorhersagten. Wie erwartet, zeigten sich beschleunigte Reaktionszeiten für hohe vs. niedrige Belohnungen bei jungen Probanden, jedoch nicht bei den älteren. Dieses Muster ging einher mit spezifischen Änderungen in neuronalen Theta-Oszillationen (4-7 Hz). Zudem ergab eine Analyse struktureller MR-Daten, dass die Integrität der dopaminergen Substantia Nigra / Area Tegmentalis Ventralis (gemessen mittels Magnetization Transfer; MT-Imaging) interindividuelle Varianzen innerhalb der Gruppe der Alten vorhersagte. Diese Ergebnisse legen den Schluss nahe, dass altersbedingte Degenerationen des dopaminergen mesolimbischen Systems den Zusammenhang zwischen belohnungsbedingter Motivation und neuronaler Theta-Oszillation modulieren.

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NOTIZEN



## **Rich Club und Diverse Club in Morbus Alzheimer: Eine multimodale Imaging-Studie**

Markett, Sebastian

Humboldt Universität zu Berlin, Deutschland

Die Atrophierung der grauen Substanz ist ein Marker der Alzheimer'schen Erkrankung und kann mittels Magnetresonanztomographie erfasst werden. Ein weiterer wichtiger Marker ist der Grad der Beta-Amyloid Ablagerungen, der mittels radionuklearer Bildgebungsmethoden ermittelt werden kann. Der aktuelle Beitrag verbindet diese beiden Bildgebungsmethoden bei Alzheimer-Patienten und gesunden Kontrollprobanden mit Hirnnetzwerkdaten aus dem Connectome-Paradigma, um die topologische Verteilung von Atrophie und Amyloid-Ablagerungen zu untersuchen.

Das Connectome-Paradigma betrachtet das Gehirn als Netzwerk. In Hirnnetzwerken formen einige Hirnregionen ein zentrales Kollektiv, das besonders reich an strukturellen Verbindungen ist: Den Rich Club. Rich-Club-Regionen scheinen bei Alzheimer-Patienten besonders stark zu atrophieren, während die Rich-Club-Organisation des gesamten Hirnnetzwerks weitestgehend intakt bleibt. Im vergangenen Jahr wurde mit dem Diverse Club ein weiteres Kollektiv in Hirnnetzwerken beschrieben, das unabhängig vom Rich Club ist. Über eine mögliche Rolle des Diverse Clubs in der Alzheimer-Erkrankung ist noch nichts bekannt.

Durch die Kombination eines Referenzkonnectoms, das aus DTI-Daten von 215 gesunden, jungen Probanden erstellt wurde, mit MRT- und Florbetapir-PET Daten von älteren Probanden mit und ohne Morbus Alzheimer konnten wir zeigen, dass bei der Alzheimer-Erkrankung a) Rich-Club-Regionen stärker atrophieren als Regionen außerhalb des Rich Clubs, b) ein solcher Zusammenhang für den Diverse Club nicht besteht, c) Regionen außerhalb des Rich Clubs stärker Amyloid-belastet sind als Rich-Club-Regionen, und d) dies besonders stark auf Regionen des Diverse Clubs zuzutreffen scheint. Die Ergebnisse werden aus netzwerktheoretischer Perspektive diskutiert.

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NOTIZEN

### 2.1.3 Non-invasive brain stimulation in clinical and basic research [Hörsaal A3]

Philipp Ruhnau, Otto-von-Guericke-Universität, Magdeburg, Deutschland

Katharina Rufener, Klinik für Neurologie, Otto-von-Guericke-Universität,  
Magdeburg, Deutschland

Non-invasive brain stimulation (NIBS) is a popular research tool, since it allows the direct investigation of brain activity underlying a cognitive or sensory function. With NIBS brain activity that has been linked to a specific function is systematically modulated, which allows causal inferences on the brain-behavior relationship. Furthermore, NIBS comes at relatively low cost and shows rarely and little side effects. This makes it a valuable alternative for other treatments, e.g., medical drugs or trainings. However, the mechanisms of action of NIBS are still not fully understood and optimal stimulation parameters are under scrutiny. In this symposium we will give an overview of the application fields of NIBS mainly focusing on transcranial electric stimulation (tES). Studies presented here include different NIBS methods such as transcranial alternating current stimulation (tACS), transcranial direct current stimulation (tDCS) and transcranial random noise stimulation (tRNS). Johannes Voßkuhl will focus on the process of planning and conducting tACS-studies, the methodological questions that arise as well as the parameters that need to be set by the researcher. Then, Katharina Rufener will focus on how tACS can be used to investigate the functional relevance of neural oscillations in the context of speech processing. Stefan Schoisswohl uses tRNS together with auditory steady state responses (ASSRs) and in clinical trials in depression and chronic tinnitus. Vera Moliadze will give an overview of pediatric studies with tES application and focus on how age and individual differences impact tES effects in children and adolescents.

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NOTIZEN

## How to efficiently conduct a tACS study

Vosskuhl, Johannes; Herrmann, Christoph S.

Universität Oldenburg, Deutschland

Over the last decade, transcranial alternating current stimulation (tACS) evolved as a widely used tool to test correlational theories of brain oscillations for their causal relevance. New applications and refined stimulation procedures are published frequently, which allow researchers to design ever more specific and sophisticated experiments. In the process of planning and conducting a tACS-study, the researcher is faced with a virtually unlimited set of options. Many methodological questions arise and many parameters have to be set. First, the experimental design needs to be decided. How many groups and conditions do I need to measure? What is the best control condition? Should I measure within or between subjects? In which variable will my effect show? Also, some more practical considerations affect the success of a stimulation experiment: Should I use individual or fixed parameters over subjects? Do I need EEG measurements? How can I control the successful operation of the stimulation setup during recording? Finally, concrete stimulation parameters have to be set, such as the size, positioning and number of electrodes or the duration, intensity and frequency of the stimulation signal. Many of these questions are not easy to answer in general, and many of the decisions are mutually dependent. In addition, there is a vivid discussion on the best practice in many of these questions. The talk will give a synopsis of current developments and established procedures in tACS research and give suggestions on how to take informed decisions about many of the parameters at hand.

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NOTIZEN

**Assessing the effect of 40 Hz-transcranial alternating current stimulation (tACS) on speech processing**

Rufener, Katharina

Klinik für Neurologie, Otto-von-Guericke-Universität, Magdeburg, Deutschland

In the human auditory cortex, neural oscillations in the gamma range are the dominant rhythmic activation pattern, i.e. its resonance frequency (RF). With regard to speech processing, there is broad consensus that these gamma oscillations parse the acoustic stream into linguistically meaningful units at the phonemic scale. An RF of about 40 Hz has been suggested as most functional since the mean duration of phonemes (the smallest linguistically meaningful unit) is in a range of about 25 ms. Accordingly, a markedly divergent RF should severely affect the integration of successively incoming acoustic features to a meaningful entity. However, to date, there is only limited data available that casually confirm this theoretical framework.

In a series of studies we used tACS to shed more light on the relationship between neural gamma oscillations and phoneme processing. By applying weak sinusoidal currents at a specific frequency, tACS modulates oscillatory patterns in the stimulated cortical areas and, in consequence, allows drawing causal conclusion between neural oscillations and (altered) sensory processes. Results of our studies confirm the notion that gamma oscillations are functionally relevant in phoneme processing. Moreover, we found that a single dose of 40 Hz-tACS increases phoneme processing acuity in individuals with reduced precision of the auditory system.

The findings of these studies will be discussed with regard to the underlying mechanisms of action and implications for the clinical application.

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NOTIZEN

**Examples of clinical and basic research of transcranial random noise stimulation**

Schoisswohl, Stefan; Kreuzer, Peter; Langguth, Berthold; Schecklmann, Martin

Department of Psychiatry and Psychotherapy, University of Regensburg, Germany

Transcranial random noise stimulation (tRNS) is a specific form of transcranial alternating current stimulation. Alternating currents applied at random frequencies are considered to act excitatory with interference to neural oscillations mediated by sodium channels. Another possible mechanism might be stochastic resonance, i.e., input of noise to a system increases the chance that weak signals exceed the threshold. Since the first publication ten years ago tRNS effects on motor cortex excitability, learning paradigms and in clinical conditions were investigated in a small number of studies. Here, we report basic research of temporal cortex tRNS on auditory steady state responses (ASSRs). High-frequency tRNS increased 40Hz amplitude modulated ASSRs and theta band power which could not be replicated in a second study which by contrast showed suppression of the increase of alpha power and suppression of the decrease of 20Hz amplitude modulated ASSRs by high- and low-frequency tRNS. We also present clinical research in depression and tinnitus. One randomized sham-controlled clinical trial in depression was cancelled after interim analysis. Amelioration of symptoms was higher in the sham in contrast to the verum arm in this add-on design study. In a one-arm pilot study in chronic tinnitus tRNS was not superior to earlier applied repetitive transcranial magnetic stimulation (rTMS). However, responders were different for tRNS in contrast to rTMS. These studies affirm the current and ongoing debate of variability in non-invasive brain stimulation and highlight the need for further studies in this so far neglected area of non-invasive brain stimulation.

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NOTIZEN

**Developmental aspects of transcranial electrical current stimulation**

Moliadze, Vera

Universitätsklinikum Schleswig-Holstein (UKSH), Christian-Albrechts-Universität zu Kiel, Deutschland

As has been shown in a great number of studies, transcranial electrical current stimulation (tES) can induce changes in regional cortical excitability and plasticity as well as in functional connectivity of brain networks and, in such a way, can modify perceptual, motor and cognitive functions. Due to a good tolerability, easy application tES, especially transcranial direct current stimulation (tDCS) has been successfully used to treat various neurological and psychiatric disorders. Because of clear advantages, tDCS may be integrated into the multimodal treatment of neurodevelopmental disorders. However, systematic investigations of suitable stimulation parameters, relevant stimulation context and possible side effects are so far lacking in children and adolescents.

Since the developing brain shows a greater capacity of brain plasticity, transcranial electrical brain stimulation(tES) might induce benefits in children. The Talk will give an overview how age and individual differences impact tES effects in healthy children and adolescents. Additionally, the research consortium STIPED (stimulation in pediatrics, European Union's Horizon 2020, grant agreement No 731827) will be introduced which aims (1) to characterize interaction between brain development and effects of transcranial direct current stimulation (tDCS) on neuropsychological function and (2) to apply individual head modeling and electrical current estimation to guide individualized treatment with tDCS in different stages of development.

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NOTIZEN

#### **2.1.4 Feel it still? How subthreshold tactile stimulation can modulate perception and neuronal activity [Hörsaal A4]**

Joachim Lange

Heinrich Heine Universität, Düsseldorf

Our senses receive multiple bits of information. Only a fraction of this stream of information reaches perceptual awareness, while most of the information goes unnoticed. But even if the information is not consciously perceived, it can still reach the cortex and elicit neuronal activity or influence perception of other stimuli. Despite recent advances, the neuronal correlates of unconscious perception and their impact on behaviour are still under debate.

In this symposium, we will present recent findings on the neuronal processing of unconsciously perceived stimuli. Using a wide range of methodological approaches like EEG, MEG, fMRI, tACS and behavioural studies, the talks of this symposium will provide new insights on the cortical levels activated by unconsciously perceived stimuli, the underlying neuronal mechanisms, how thresholds for (un)conscious perception can be modulated, and finally the impact on perception of other stimuli.

In summary, the symposium will provide a state-of-the art overview of different methodological approaches and research targeting the mechanisms of unconscious perception.

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NOTIZEN

**Subliminal tactile stimuli rhythmically modulate perception and neuronal activity**

Lange, Joachim; Baumgarten, Thomas J.; Schnitzler, Alfons

Heinrich Heine Universität, Düsseldorf, Deutschland

Although not consciously perceived, subliminal (i.e., below perceptual threshold) stimuli are known to elicit neuronal activity in early sensory areas. In a recent study, we could show that subliminal tactile stimuli are also able to modulate perception of subsequent suprathreshold stimuli in a rhythmic pattern: Depending on the interstimulus interval between subliminal and suprathreshold stimuli, perception of the suprathreshold stimuli was impaired or improved in a rhythmic pattern, alternating with a frequency of 13-17 Hz, i.e. in the beta-band.

Here, I will present new insights in the neuronal mechanisms underlying this rhythmic modulation of perception by subliminal stimuli. Using magnetoencephalography (MEG), we studied the influence of subliminal stimuli on neuronal oscillations. We show that subliminal tactile stimuli elicit neuronal activity only in early somatosensory areas. Moreover, subliminal stimuli induce a phase reset of neuronal oscillations in the beta band ( $\sim 15-20$  Hz), while suprathreshold stimuli induce a phase reset of neuronal oscillations presumably in the theta band ( $\sim 3-7$  Hz).

Notably, the modulation of neuronal oscillations and the rhythmic modulation of perception by subliminal stimuli occur in highly similar frequency bands. In my talk, I will discuss the potential impact of the modulations of neuronal activity on perceptual mechanisms.

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NOTIZEN



**From local interactions to frontoparietal networks: model-based fMRI dissociates somatosensory awareness from perceptual uncertainty, response selection, and motor planning**

Schröder, Pia Katharina; Schmidt, Timo Torsten; Blankenburg, Felix

Neurocomputation Neuroimaging Unit, Freie Universität Berlin, Deutschland

Somatosensory awareness is commonly studied using the near-threshold somatosensory detection task, an experimental paradigm in which participants detect tactile stimuli close to perception threshold. Research on this task, however, has yielded highly diverse findings with putative neural correlates ranging from local recurrent interactions between low-level sensory cortices to activation of widely distributed fronto-parietal networks. A potential source of these divergent results may reside in latent cognitive processes that often coincide with stimulus awareness in experimental settings. In fact, the classical detection task may conflate somatosensory awareness with processing of perceptual uncertainty, response selection, and motor planning, all of which have been shown to activate the frontoparietal network. To untangle corresponding neural responses, we used a novel version of the somatosensory detection task in combination with functional magnetic resonance imaging (fMRI). Participants received electrical target stimuli at intensities spanning the full range of their psychometric functions to vary stimulus uncertainty while maintaining spontaneous fluctuations in stimulus awareness. Instead of directly reporting target detection, participants reported the congruence of their somatosensory percepts with simultaneously presented visual reference cues and reported a match or mismatch by making saccadic eye movements, such that target detection was independent of response selection and motor planning. Using model-based fMRI, we track the transformation of stimulus representations along the somatosensory hierarchy and show that emergence of stimulus awareness is largely restricted to local processing in early somatosensory areas, while fronto-parietal network activity reflects perceptual uncertainty, response selection, and motor planning.

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NOTIZEN

### **Conscious and unconscious somatosensory perception and its modulation by attention**

Forschack, Norman<sup>1,2</sup>; Nierhaus, Till<sup>1,3</sup>; Müller, Matthias M.<sup>2</sup>; Villringer, Arno<sup>1,4</sup>

<sup>1</sup>Max-Planck-Institut for Human Cognitive and Brain Sciences, Leipzig; <sup>2</sup>Experimental Psychology and Methods, University of Leipzig; <sup>3</sup>Neurocomputation and Neuroimaging Unit, Department of Education and Psychology, Freie Universität Berlin; <sup>4</sup>Mind-Brain-Body Institute, Berlin School of Mind and Brain at the Humboldt-Universität zu Berlin

Most sensory input to our body is not consciously perceived. What are neural processes related to undetectable somatosensory stimuli and may preclude conscious awareness? Does attention act as a gating mechanism or does it also modulate processing of undetectable stimulation that is empirically defined to exert objective performance at chance independent of observer's individual response criterion? To address these questions, we ran two EEG experiments in healthy volunteers undergoing electrical finger nerve stimulation for various stimulation magnitudes along the individual psychometric function and measured both somatosensory evoked potentials (SEPs) and oscillatory activity in the alpha-band. In the first study, participants performed a yes-no detection task for left index finger stimulation. In the second study, participants indicated detection of stimuli at the attended finger while the left or the right index finger was stimulated.

Undetectable stimulation ( $d_{\text{prime}} \sim 0$ ) elicited a somatosensory evoked potential 50-60 ms after stimulation (P1), but no further components. Selective spatial attention increased P1-amplitudes both to detectable and undetectable stimulation. Alpha-band amplitudes directly preceding detectable and undetectable stimulation showed a negative quadratic relationship to P1-amplitudes under attention, which reversed, when the stimulated finger was ignored.

The results show that presence of the stimulus evoked P1 is not a sufficient predictor for stimulus detection. Nevertheless, attentional modulation of the alpha-rhythm obviously seems to mediate the behavioral goal—'detect' stimuli at the cued while 'ignoring' the other index finger—irrespective of stimulus detectability and supports our understanding of a general neural signature for attentional deployment that is independent of conscious perception.

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NOTIZEN

## Phasic Modulation of Human Somatosensory Perception by Transcranially Applied Oscillating Currents

Gundlach, Christopher<sup>1,2</sup>; Müller, Matthias<sup>1</sup>; Nierhaus, Till<sup>2,3</sup>; Villringer, Arno<sup>2,4,5,6</sup>; Sehm, Bernhard<sup>2,6</sup>

<sup>1</sup>Universität Leipzig; <sup>2</sup>Max-Planck-Institut für Kognitions- und Neurowissenschaften; <sup>3</sup>Center for Cognitive Neuroscience Berlin; <sup>4</sup>Mind–Brain Institute and Berlin School of Mind and Brain, Berlin; <sup>5</sup>Berlin Neuroimaging Center and Department of Neurology, Berlin; <sup>6</sup>Clinic for Cognitive Neurology, Leipzig

Ongoing oscillations seem to be relevant for various brain functions, such as somatosensory perception. Top-down-driven as well as spontaneous fluctuations of phase and amplitude of the sensorimotor mu-alpha rhythm have been linked to neural inhibitory processes relevant for somatosensory perception. However the exact mechanistic role of these oscillations is still not known. Transcranial alternating current stimulation (tACS) may offer the possibility to directly modulate neural oscillations and thereby probing their mechanistic role.

We examined the effects of tACS-modulated mu-alpha oscillations on somatosensory perception thresholds. In a randomized, single-blinded, crossover design, participants underwent a combined EEG/tACS experiment in two separate sessions (real or sham tACS). After identifying subjects' individual mu-frequency, somatosensory detection thresholds were determined using a continuous adaptive staircase procedure while weak electric stimuli were presented to the right index finger. In between, either 5 minutes of tACS was applied at the individual mu frequency over both primary somatosensory cortices (mu-tACS) or 30 s of 1 mA random noise stimulation was applied (sham).

We observed no tonic (i.e. mu-amplitude driven) modulation of somatosensory perception by mu-tACS as compared to sham. However, during mu-tACS, somatosensory detection thresholds were phasically modulated, differing maximally for stimuli presented at opposite phases of the mu-tACS signal curve. No such modulation was observable when tACS was applied with the visual alpha frequency over visual areas.

Our findings support the mechanistic relevance of mu-alpha oscillations for somatosensory perception. Mu-alpha seems to create phases of increased and decreased likelihood for perception of weak stimuli.

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NOTIZEN

### 2.1.5 Spiegelung der Dynamik von Erinnerungen in der Psychophysiologie [Hörsaal A5]

Katja Volz, IGPP Freiburg

Unsere Erinnerungen sind kein starres Abbild der Vergangenheit, sondern verändern sich dynamisch. Das heißt, Gedächtnisinhalte werden laufend durch verschiedene Prozesse und Einflüsse verändert. Dies passiert nicht nur während der Konsolidierung, sondern auch während der Rekonsolidierung und dem Abruf unserer Erinnerung. Dabei können Erinnerungen abgeschwächt, gestärkt oder aktualisiert werden. In den letzten Jahrzehnten rückte nicht nur die Veränderbarkeit von Gedächtnisprozessen ins Zentrum der Forschung, sondern auch die Untersuchung psychophysiologischer Korrelate während dynamischer Erinnerungsprozesse. Im Symposium wird Einblick in verschiedene Aspekte dynamischer Erinnerung gegeben: Es werden zwei Einflüsse vorgestellt, die unsere Erinnerung verändern können (Stress und irreführende Informationen), sowie verschiedene Zeitpunkte betrachtet, an denen diese Einflüsse zum Tragen kommen. Außerdem wird die Frage gestellt, wie die Psychophysiologie zu einem besseren Verständnis der Dynamik unseres Gedächtnisses beitragen kann. Lisa Catherine Dandolo berichtet über die zeitabhängige Veränderung der Erinnerung von detaillierten, episodischen hin zu eher semantischen Erinnerungen. Dabei stellt sie fMRT-Daten vor, die die Dynamik unserer Erinnerung in neuronalen Reorganisationen widerspiegeln. Janine Wirkner berichtet über die Einflüsse von chronischem Stress auf emotionale Lern- und Gedächtnisprozesse während der Konsolidierung und des Abrufs von Erinnerungen. Sie wird außerdem auf ereigniskorrelierte Potentiale während des Erinnerungsabrufs eingehen. Die nächsten beiden Vorträge untersuchen den Einfluss nachträglicher irreführender Informationen auf die Erinnerung im Falschinformationsparadigma. Natascha Anka berichtet, ob ebendieser Einfluss durch ein strukturiertes Interview abgeschwächt werden kann und geht auf peripher-physiologische Korrelate veränderter Erinnerung genauer ein. Katja Volz berichtet über die mögliche Unterscheidung verfälschter von echten Erinnerungen durch ereigniskorrelierte Potentiale.

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NOTIZEN

## **Zeitabhängige Gedächtnistransformation entlang der hippocampalen anterior-posterior Achse**

Dandolo, Lisa; Schwabe, Lars

Universität Hamburg, Deutschland

Mit der Zeit durchlaufen Erinnerungen eine Transformation von detaillierten, episodischen zu eher semantischen Erinnerungen. Dabei wird angenommen, dass diese Transformation mit einer neuronalen Reorganisation des Gedächtnisses vom Hippocampus in eher neokortikale Areale einhergeht. Jedoch wurde der Hippocampus hierbei stets als einheitliche Struktur betrachtet. In einer aktuellen fMRT-Studie betrachteten wir die mit der zeitlichen Dynamik des Gedächtnisses verbundenen neuronalen Veränderungen innerhalb der hippocampalen anterior-posterior Achse. Gesunde Versuchspersonen lernten verschiedene Bilder und führten entweder einen Tag oder 28 Tage später eine Bilder-Wiedererkennungsaufgabe im MRT-Scanner durch. Dabei wurden zusätzlich zu den alten Bildern und neuartigen Bildern auch semantisch ähnliche Bilder mit veränderten Details präsentiert. Insgesamt war die Gedächtnisleistung nach 28 Tagen im Vergleich zu einem Tag reduziert. Eine signifikant erhöhte false alarm Rate für ähnliche Bilder im Gegensatz zu vollständig neuartigen Bildern nach 28 Tagen zeigte jedoch, dass vier Wochen alte Erinnerungen speziell durch einen Verlust an Detailwissen gekennzeichnet waren, was auf eine Transformation zu eher semantischen Erinnerungen hindeutet. Die fMRT Daten zeigten, dass die Aktivität im anterioren Hippocampus nach 28 Tagen signifikant abnahm und mit dem Detailreichtum der Erinnerungen korrelierte. Außerdem zeigten die multivariaten neuronalen Repräsentationen im anterioren Hippocampus besonders spezifische Muster für die verschiedenen Bilder. Dagegen waren die neuronalen Muster im posterioren Hippocampus weniger spezifisch, insbesondere nach 28 Tagen. Außerdem nahm die neuronale Aktivität im posterioren Hippocampus nach 28 Tagen im Gegensatz zu einem Tag nicht ab. Diese Befunde zeigen eine zeitabhängige Reorganisation innerhalb des Hippocampus entlang seiner anterior-posterioren Achse, die mit der Transformation hin zu eher abstrakten Erinnerungen zusammenhängt.

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NOTIZEN

## **Einfluss von chronischem Stress auf emotionale Lern- und Gedächtnisprozesse**

Wirkner, Janine<sup>1</sup>; Ventura-Bort, Carlos<sup>2</sup>; Schwabe, Lars<sup>3</sup>; Hamm, Alfons<sup>1</sup>; Weymar, Mathias<sup>2</sup>

<sup>1</sup>Universität Greifswald, Institut für Psychologie, Lehrstuhl für Physiologische und Klinische Psychologie/ Psychotherapie; <sup>2</sup>Universität Potsdam, Department Psychologie, Emotions- und Biopsychologie; <sup>3</sup>Universität Hamburg, Institut für Psychologie, Kognitionspsychologie

In Abhängigkeit von Stärke und Dauer der Stressinduktion werden fördernde oder beeinträchtigende Effekte von akutem Stress während der Enkodierung auf emotionale Lern- und Gedächtnisprozesse beobachtet. In chronisch gestressten Gruppen werden häufig Gedächtnisschwierigkeiten berichtet. Neuronale Mechanismen emotionaler Lern- und Gedächtnisprozesse in Abhängigkeit von der chronischen Stressbelastung im Vergleich zu akutem Stress sind jedoch weniger gut untersucht.

In dieser Studie untersuchten wir deshalb an 20 gesunden Frauen (Alter  $M = 21$ ) den Einfluss von chronischem Stress auf die Verarbeitung neutraler und emotionaler Bilder mittels ereigniskorrelierter Potentiale. Die Teilnehmerinnen betrachteten je 30 unangenehme, angenehme und neutrale Bilder, während ein hochauflösendes EEG abgeleitet wurde. Eine Woche später absolvierten sie einen unerwarteten Wiedererkennenstest. Als Marker für chronischen Stress wurde das mittlere Haarcortisollevel (6 Monate vor Untersuchung) verwendet. Erwartungsgemäß zeigten sich erhöhte Positivierungen über centroparietalen Arealen (Late positive potential; LPP) zwischen 400-900 ms für emotionale im Vergleich zu neutralen Bildern, was für eine verstärkte Aufmerksamkeitszuwendung spricht. Höhere Haarcortisolkonzentrationen waren mit größeren LPP Amplituden für unangenehme und neutrale Bilder, nicht aber für angenehme Bilder, assoziiert. Im Gedächtnistest wurden emotionale Bilder besser erinnert, hohes Haarcortisol ging aber mit einer geringeren Gedächtnisleistung, insbesondere für emotionale Bilder, einher.

Die Ergebnisse deuten darauf hin, dass höherer chronischer Stress zum einen zu einer verstärkten Aufmerksamkeitszuwendung zu Stimuli unangenehmer und neutraler Valenz führen und zum anderen möglicherweise die Konsolidierung und den Gedächtnisabruf, insbesondere für emotionale Inhalte, beeinträchtigen kann. Dieser Befund trägt zum Verständnis der Zusammenhänge von chronischem Stress und emotionalen Gedächtnisprozessen bei, welche eine Rolle bei der Entstehung und Aufrechterhaltung klinischer Störungen

spielen.

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NOTIZEN

### **Einfluss des Eigenständigen Vernehmungsprotokolls für Augenzeugen (EVA) auf den Falschinformationseffekt – eine psychophysiologische Studie**

Anka, Natascha<sup>1</sup>; Heinrichs, Markus<sup>2</sup>; Ambach, Wolfgang<sup>1</sup>

<sup>1</sup>Institut für Grenzgebiete der Psychologie und Psychohygiene e.V. (IGPP);

<sup>2</sup>Albert-Ludwigs-Universität Freiburg

Der verfälschende Einfluss nachträglicher irreführender Information auf die Erinnerung wird Falschinformationseffekt genannt (Loftus, 2005). Falschaussagen von Augenzeugen infolge irreführender Information können vor Gericht weitreichende Folgen haben. In der Praxis wird das Self-Administered-Interview (SAI; dt. Version Eigenständiges Vernehmungsprotokoll für Augenzeugen, EVA) dazu genutzt, die Erinnerung zu festigen und spätere suggestive Einflüsse zu vermindern. Dies soll in einer psychophysiologischen Studie überprüft werden. 50 Versuchspersonen sahen ein Video eines fingierten Diebstahls. Acht randomisiert ausgewählte Details dienten als Originalinformation. Danach bearbeitete die Hälfte der Teilnehmenden das EVA, die andere Hälfte eine Alternativaufgabe. Nach Ablauf einer Woche erhielten die Versuchspersonen acht Fragen zum Video; vier davon enthielten irreführende Details. Darauf folgte eine Erinnerungsabfrage mit peripherphysiologischer Messung. Abschließend wurden die Erinnerungssicherheit sowie die auditive und visuelle Erinnerungsqualität erhoben. Vorläufige Ergebnisse (N=20) weisen darauf hin, dass der Falschinformationseffekt mit dem verwendeten Versuchsmaterial repliziert werden konnte. Der erwartete Effekt der Bearbeitung des EVA auf die Häufigkeit verfälschter Erinnerungen kann bislang nicht statistisch belegt werden. Die psychophysiologischen Ergebnisse werden im Vortrag präsentiert und mögliche peripherphysiologische Korrelate von verfälschten und unverfälschten Erinnerungen diskutiert.

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NOTIZEN



**Frontale ereigniskorrelierte Potentiale unterscheiden sich zwischen echten und falschen Erinnerungen im Falschinformationsparadigma**Volz, Katja<sup>1</sup>; Stark, Rudolf<sup>2</sup>; Ambach, Wolfgang<sup>1</sup>

<sup>1</sup>Institut für Grenzgebiete der Psychologie und Psychohygiene e. V. (IG-PP), Freiburg, Deutschland; <sup>2</sup>Bender Institute of Neuroimaging, Universität Gießen

Das menschliche Gedächtnis bildet die Realität nicht perfekt ab, sondern konstruiert eine Erinnerung aus verschiedenen Informationen. Dies ist in vielen Situationen adaptiv, kann aber zu falschen Erinnerungen führen. Falsche Erinnerungen sind Erinnerungen an Ereignisse oder Details, die nicht wirklich oder eigentlich anders passiert sind. Im Falschinformationsparadigma werden irreführende Informationen dazu genutzt, die Erinnerung an ein Originalereignis zu verfälschen (Loftus, 2005). Kann die Physiologie helfen, echte von falschen Erinnerungen zu differenzieren? In einer Studie mit 40 Versuchspersonen wurde untersucht, ob sich ereigniskorrelierte Potentiale im EEG (EKPs) zwischen echten und falschen Erinnerungen unterscheiden. Zuerst wurde ein Video gezeigt, das acht randomisierte Details enthielt (z.B. die Farbe eines Umschlags). Nach einer Woche wurden in einem Text vier der acht Details durch irreführende Information ersetzt. Während der nachfolgenden Erinnerungsabfrage wurde ein EEG abgeleitet. Der Falschinformationseffekt konnte repliziert werden. Entgegen früherer Befunde zu EKPs bei falschem Wiedererkennen ergaben sich keine Unterschiede in der P300 und dem LPC, stattdessen zeigte sich ein starker Unterschied zwischen „Ja“ und „Nein“-Antworten in parietalen EKPs: „Ja“-Antworten gingen mit einer stärkeren Positivierung als „Nein“-Antworten einher. Es wurden außerdem Unterschiede in der FN400 zwischen echten und falschen Erinnerungen gefunden: Falsche Erinnerungen gingen mit einer geringeren frontalen Negativierung als echte Erinnerungen einher. Es ergeben sich zwei Schlussfolgerungen: Erstens, die parietale Aktivierung spiegelt lediglich die subjektiv erlebte Erinnerung wieder. Zweitens, die frontale Aktivierung unterscheidet sich zwischen echten und falschen Erinnerungen und beinhaltet damit inkrementellen Wert über die subjektiv berichtete Erinnerung hinaus. Das heißt, frontale EKPs könnten zu einer Unterscheidung echter von falschen Erinnerungen beitragen.

## **2.2 Keynote 2: 11:00-12:00 Uhr; Onur Güntürkün: Brain Asymmetries: A Mechanistic Neuronal View [Hörsaal A1]**

Onur Güntürkün

Research Department of Neuroscience, Ruhr-Universität Bochum

Left-right differences of brain and behavior are a common feature of the animal kingdom, incl. humans. In our species, practically all perceptual, cognitive or motor systems are lateralized with respect to at least some of their components. Despite this relevance, we have hardly any detailed insights on the neuronal fundamentals of brain asymmetries. Why do we know so little about the neurobiology of lateralization? I guess, the answer is simple: For more than a century, scientists thought that brain asymmetries are unique to humans. As a consequence, they never seriously attempted to develop animal models of left-right differences. Now that we overcame this mistake, it is high time to catch up with the time wasted in ignorance. Using humans and pigeons as model organisms, my aim is to establish mechanistic explanations that bridge the gap between neurons and lateralized behavior. During my talk in Gießen, I will talk about three core questions: First, how do brain asymmetries develop during ontogeny? Second, how do these early ontogenetic steps lead to asymmetries of long-range fiber pathways in the brain? Third, how is the commissural interaction between the hemispheres organized? I will argue, (1) that the onset of brain asymmetries often depends on both genetic and epigenetic factors that affect non-cortical and partly even non-neuronal systems; (2) that asymmetries of fiber pathways are the core blueprint of brain asymmetries, and (3) that commissural interactions can swiftly increase or decrease asymmetries by prolonging or accelerating the spike threshold of the subdominant hemisphere.

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NOTIZEN

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NOTIZEN

## 2.3 Symposienblock IV: 13:00-14:30 Uhr

### 2.3.1 Brain and cognition in the real world: Recent advances in mobile EEG [Hörsaal A1]

Edmund Wascher, Leibniz-Institut für Arbeitsforschung a.d. TU Dortmund

Human cognition has not evolved to deal only with the processing of well-defined, small bits of information as usually presented in highly controlled, artificial laboratory environments. In natural situations, our own actions, and the actions of others we are interacting with, have to be integrated into a rich and complex multi-sensory context. Only a comprehensive representation of the outer world enables us to interact with others, deal with complex task demands, and execute goal-directed actions. This symposium will focus on more realistic, ecologically valid task demands. The contributions explore opportunities to study brain-electrical correlates of cognitive processes in real world, uncontrolled and non-stationary environments.

Over the past few years, mobile EEG technology has developed rapidly. Mobile EEG is not only portable, it allows us to capture good-quality brain-electrical activity during natural movements and in complex, uncontrolled real-world situations. Miniaturization of hardware is ongoing, but wireless acquisition of EEG signals, stimulus presentation and behavioral response capture on a single off-the-shelf Android smartphone is already possible. With the advent of new sensors and new amplifiers, the unobtrusive, ambulatory assessments of brain states will soon be feasible. By transferring knowledge gained in laboratory environments to real-world scenarios, mobile EEG opens up the opportunity to study real-world demands on selective attention (Sterr), visual perception (Händel) and episodic memory processes (Debener). Moreover, by investigating how mental states influence cognition in real-life situations (Wascher), we will outline how merging knowledge gained in the lab with real-world evidence can advance our understanding of ecologically valid neuro-cognitive processes.

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NOTIZEN

**Out and about: EEG markers of attention during natural walking**

Sterr, Annette; Johnstone, Nicola

University of Surrey, Vereinigtes Königreich

With mobile EEG it is possible to obtain robust ERPs when participants are walking around as first demonstrated by ( Debener, Minow, Emkes, Gandras, & de Vos, 2012). Based on these initial findings, we conducted a series of studies to determine the effects of walking on cognition, using two ERP components derived from the oddball task, the P3 and the mismatch negativity. Walking in natural settings, in particular when outdoors, induces greater perceptual load and thus presents more cognitively challenging circumstances. The posture-first principle further states that stable walking is prioritised over cognition through the preferential allocation of cognitive and perceptual resources to maintain balance. We therefore predicted that fewer cognitive resources are available in stimulus-rich environments, such as sitting outside, and, even more so, when walking outdoors. Three experiments with four conditions (sitting indoors, sitting outdoor, walking indoors and walking outdoors) were conducted with University students. The data suggest that walking does indeed influence attentional function, such that walking outdoors reduces the P300 and attenuates the mismatch negativity, i.e. attentional control is less effective. However, these attention effects are not necessarily related to the act of walking directly, but the cognitive functions that enable operational walking as well as the cognitive and perceptual demands of the environment. Initial findings from older persons support the notion of an interaction between the dynamic cognitive processes that maintain walking and functional cognitive operations, and that this interaction is becoming more pronounced with age.

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NOTIZEN

## **How walking influences human visual perception and sensory cortical activity**

Haendel, Barbara; Cao, Liyu

University Wuerzburg, Deutschland

Our knowledge about human perception largely derives from laboratory research where participants are required to sit still, keep fixation, etc. Recent animal work shows that locomotion can drastically change neural responses from the visual cortex. Such influences have rarely been addressed in humans.

We investigated the effect of free walking on visual perception by analysing mobile electrophysiological (EEG) and behavioural responses in humans. EEG data were collected from 30 subjects while standing still or walking at different speeds. Participants performed a contrast detection task in a centrally presented flickering grating under different levels of surround contrast. Central visual processing was assessed using steady state visual evoked potentials (SSVEP) introduced by the flicking grating.

Our data shows a significant interaction between walking speed and surround contrast on the SSVEP amplitude, which indicates that the surround exerts more influence (surround suppression) on the central input during walking compared to standing still. Our behavioural data (detection rate/response time) further supports such changed peripheral influence during walking. Interestingly, we found alpha power ( $\sim 10\text{Hz}$ ), often associated with inhibition, to be much stronger during standing as compared to walking and to be positively correlated with the SSVEP amplitude.

Our data suggests that the allocation of processing within the visual field is different during walking compared to standing still. While not moving, a stronger focus seems to lie on central visual processing while peripheral input is suppressed as mediated by increased alpha power. This work is supported by the ERC starting grant “BBRhythms 677819”

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NOTIZEN

**Smartphone EEG captures the subsequent memory effect in a natural environment**

Debener, Stefan<sup>1</sup>; Pineyro Salvidegoitia, Maria<sup>1</sup>; Jacobsen, Nadine<sup>1</sup>; Griffiths, Benjamin<sup>2</sup>; Hanslmayr, Simon<sup>2</sup>

<sup>1</sup>Dept. of Psychology, University of Oldenburg, Deutschland; <sup>2</sup>Dept. of Psychology, University of Birmingham, UK

Spatio-temporal context plays an important role in episodic memory. While temporal context effects have been frequently studied in the laboratory, ecologically valid spatial context manipulations are difficult to implement in stationary conditions. We investigated whether the neural correlates of successful encoding (subsequent memory effect) can be captured in a real-world environment. An off-the-shelf Android smartphone was used for wireless mobile 24-channel EEG acquisition and stimulus presentation. N=25 participants encoded single words, each was presented at a different location. Locations were on Oldenburg University campus and approximately 10-12 meters away from each other. Half of the locations had striking features nearby, such as a tree or a building corner. We predicted that those landmarks would improve recall performance. After a first word free recall task indoors, participants guided the experimenter outdoors for a second recall task, in which words and locations had to be recalled. As predicted, significantly more words presented at landmark compared to non-landmark locations were recalled. Moreover, significantly more landmark than non-landmark locations were recalled. Time-frequency analysis revealed two significant clusters, among them a stronger theta power increase for hits versus misses at approximately 600-800 ms after word onset. Our results confirm that a vibrant spatial context is beneficial in episodic memory processing and that the underlying neural correlates can be captured with unobtrusive smartphone EEG technology. We conclude that the advent of mobile EEG technology helps to unveil the relevance of natural physical activity and natural environments on memory.

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NOTIZEN

**Assessing mental state in natural environments**

Wascher, Edmund; Reiser, Julian; Pacharra, Marlene; Rinkenauer, Gerhard; Getzmann, Stephan; Arnau, Stefan

Leibniz-Institut für Arbeitsforschung a.d. TU Dortmund, Deutschland

Mental strain is an important issue in recent research on occupational health. Both, depletion due to information overload as well as bore-outs due to the monotony of automatized working environments are substantial accident hazards and a potential contributor to stress-related diseases. Mobile EEG may help to better classify these mental states and provide predictions about the availability of cognitive resources in a given situation. In a series of workplace and driving simulation studies, mobile EEG recording equipment (a.o. unobtrusive around-the-ear electrode arrays = cEEGrids) was used in order to evaluate task load and mental resources in naturalistic environments. We can demonstrate that the power in the Alpha band is closely related to task engagement whereas Theta activity rather reflects effort that is invested to keep performance high. The latter therefore reflects a mechanism that is prone to contribute to depletion of mental resources. In a recent study, 16 young and 16 older participants had to drive along a winded road for about an hour in the driving simulator. According to the two mechanisms outlined above, in particular older participants that showed high Theta power also managed to keep high performance with time on task, whereas younger participants with high Alpha power were more distractible. Many of these effects were reliably measurable also with cEEGrids that cover only a small area behind the ear but are invisible for the environment. Thus, mobile EEG becomes a valuable tool to investigate mental strain in realistic occupational settings.

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NOTIZEN



### 2.3.2 Neues aus der Stressforschung: Aktuelle Befunde zum Einfluss von Stress auf emotionale und kognitive Prozesse [Hörsaal A2]

Mauro Larra, Universität Trier

Dieses Symposium gibt einen Einblick in die aktuelle Forschung zu kognitiven und emotionalen Effekten von Stress, sowie deren Verhaltensrelevanz und klinische Implikationen. Stress ist gekennzeichnet durch eine Ausschüttung von Cortisol und Adrenalin/Noradrenalin, die direkt oder über viszerale Afferenzen Einfluss auf zentralnervöse Strukturen nehmen, welche emotionale und kognitive Prozesse vermitteln. Ein gut belegter Befund ist, dass Stress Gedächtnisprozesse moduliert. Neuere Arbeiten zeigen, dass es beim Lernen durch Stress zu einer qualitativen Verschiebung kommt und Lisa Marieke Klün wird aktuelle Ergebnisse zum Einfluss von Stress und Stresshormonen auf die Verwendung von Vorwissen beim Lernen sowie auf die neuronalen Korrelate solch schemabasierter Lernprozesse präsentieren. Es gibt eine Vielzahl von Verbindungen zwischen emotionsrelevanten limbischen Strukturen und den Stresszentren im Gehirn und die emotionale Bewertung eines Stressors verändert die Stressreaktion. Die komplexe Wechselbeziehung zwischen Stress und Emotion wird in zwei weiteren Vorträgen beleuchtet. Johannes Finke wird über den differentiellen Einfluss von sozialer Evaluation während Stressexposition auf emotionale und physiologische Komponenten der Stressantwort sowie deren Zusammenhang berichten. Mauro Larra wird die Bedeutung frontaler alpha-Asymmetrien als physiologisches Maß emotionaler Regulation für die Stressreaktion darstellen. Über mögliche psychopathologische Konsequenzen einer stressbedingten Veränderung emotional-kognitiver Prozesse wird Linn Kühl mit einer Studie zum Einfluss von noradrenerger Aktivierung und lebensgeschichtlich frühem Trauma auf emotionale Aufmerksamkeitsprozesse bei Probanden mit und ohne Depression berichten. Die Verhaltensrelevanz emotionaler Veränderungen durch Stress wird abschließend von Daniel Best in einem Vortrag zum Einfluss von simuliertem Blutverluststress auf Annäherungs-/Vermeidungsverhalten in einem emotionalen 3-D Paradigma aufgezeigt.

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NOTIZEN

## **Stress und Glucocorticoide beeinträchtigen Schema-basiertes Lernen**

Klün, Lisa Marieke<sup>1</sup>; Vogel, Susanne<sup>1</sup>; Nixon, Patricia<sup>1</sup>; Agorastos, Agorastos<sup>2</sup>; Wiedemann, Klaus<sup>2</sup>; Schwabe, Lars<sup>1</sup>

<sup>1</sup>Universität Hamburg, Deutschland; <sup>2</sup>Universitätsklinikum Hamburg-Eppendorf, Deutschland

Vorwissen, in Form eines ‚Schemas‘, erleichtert die Enkodierung, Konsolidierung und den Abruf von Schema-relevanten Informationen. Studien zeigten, dass besonders der mediale präfrontale Cortex (mPFC) an der Integration Schema-kongruenter Informationen in vorhandene Wissensstrukturen beteiligt ist, während Schema-inkongruente Informationen vom Hippocampus enkodiert werden. Eben diese Strukturen sind besonders anfällig für den Einfluss von akutem Stress und die Wirkungen der Stressmediatoren Cortisol und Noradrenalin. Ob Stress und diese Stressmediatoren allerdings auch Schema-basiertes Lernen – und damit die Nutzung von Vorwissen – beeinflussen ist bisher noch unbekannt. Um diese Frage zu beantworten, haben wir drei Experimente an jeweils zwei aufeinander folgenden Tagen durchgeführt. Versuchspersonen lernten ein Schema an Tag 1. An Tag 2 wurden Schema-kongruente und neuartige Informationen gelernt, nachdem Versuchspersonen entweder unmittelbar oder ca. 25 Minuten vor dem Lernen einem Stressor ausgesetzt wurden (Experiment 1); entweder ein Placebo, Hydrocortison, den alpha-2-adrenoceptor-Antagonisten Yohimbine, welcher verstärkte noradrenerge Stimulation auslöst, oder beide Wirkstoffe zusammen erhielten (Experiment 2). In Experiment 3 durchliefen die Versuchspersonen ein Stressparadigma und bearbeiteten die Lernaufgabe anschließend im MRT Scanner. Unsere Ergebnisse zeigen, dass Stress (unabhängig vom Zeitpunkt des Stressors) oder die Gabe von Hydrocortison (unabhängig von Yohimbine) Schema-basiertes Lernen beeinträchtigt, während das Lernen von Schema-inkongruenten Inhalten nicht beeinflusst wird. Auf neuronaler Ebene zeigte sich, dass bei gestressten ProbandInnen, im Gegensatz zu Kontrollpersonen, der Hippocampus auch für Schema-kongruente Inhalte aktiviert wurde und sich dieses negativ auf die Schema-assoziierte Lernleistung auswirkte. Unsere Daten zeigen somit, dass Individuen unter Stress weniger gut von ihrem Vorwissen profitieren können und haben damit Implikationen für klinische und Bildungskontexte.

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NOTIZEN

## **Dissoziation von physiologischer und emotionaler Stressreaktivität bei sozial-evaluativer Bedrohung: Befunde mit dem sozial evaluierten Handgrip-Test**

Finke, Johannes

Universität Trier, Deutschland

Frühere Befunde mit psychosozialen Stresstests deuten darauf hin, dass sich in sozial-evaluativen Situationen oftmals keine klare Korrespondenz von subjektivem Stressempfinden und dem Ausmaß der Aktivierung der HPA-Achse findet. Noch weit weniger ist darüber bekannt, wie sich im Falle primär physischer Stressoren gleichzeitige soziale Evaluation in subjektivem Erleben und physiologischer Stressreaktion niederschlägt.

Der vorliegende Beitrag diskutiert diese Frage anhand aktueller Befunde zur Auswirkung körperlicher Anstrengung im Zusammenspiel mit sozialem Stress: Mittels eines isometrischen Handgrip-Tests (3 min Dauer) wurde bei insgesamt 40 Probanden an zwei verschiedenen Tagen sowohl eine starke (45% maximale Griffkraft) als auch eine leichte (10%) Aktivierung des sympathischen Nervensystems herbeigeführt, die für die Hälfte der Stichprobe (in Stress- und Kontrollbedingung) mit simultaner Beobachtung und Feedback durch eine zuvor unbekannte Person einherging.

Relativ zur Kontrollbedingung waren in beiden Gruppen wie erwartet deutliche Anstiege von Blutdruck, Herzrate und der Frequenz phasischer Hautleitfähigkeitsreaktionen zu beobachten. Als ähnlich unspezifischer Effekt erwies sich auch die selbstberichtete Veränderung des emotionalen Befindens, die sich nicht zwischen den beiden Gruppen unterschied: Während die Probanden unabhängig von sozialer Evaluation vermehrt subjektiven Stress, Aufregung und Angst erlebten, waren jedoch nur in der sozial-evaluierten Bedingung signifikante Anstiege der Speichelcortisolkonzentration sowie eine Reduktion des parasympathischen Tonus (Herzratenvariabilität) zu verzeichnen. Diese Ergebnisse erhärten die Annahme einer partiellen Dissoziation von physiologischer und subjektiver Stressantwort: Die HPA-Achse scheint mitunter sensitiver auf soziale Faktoren zu reagieren als explizit emotionale Indikatoren. Angesichts der Zunahme sozialer Vergleiche und Monitorings jeglicher Art (im öffentlichen/beruflichen Raum) ergeben sich ferner mögliche Implikationen für die Bewertung alltäglicher Stressoren, etwa im Arbeitskontext.

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NOTIZEN

**Emotionale Stressregulation: Die Rolle frontaler alpha-Asymmetrie**

Larra, Mauro; Zhang, Xinwei; Schächinger, Hartmut

Universität Trier, Deutschland

Stress geht mit einer Veränderung emotionaler Prozesse einher und die situations- wie personenspezifische Ausprägung emotionaler Verarbeitung könnte wiederum einen Einfluss auf die oft beobachtete intra- und interindividuelle Variabilität der Stressreaktion ausüben. Frontale alpha-Asymmetrien sind ein vieldiskutiertes Maß emotionaler Regulation und spiegeln sowohl Trait wie State Anteile wieder. In der hier vorgestellten Studie wurde untersucht, inwiefern Stress zu einer Veränderung frontaler kortikaler Asymmetrien führt und ob diese einen Bezug zu verschiedenen physiologischen und subjektiven Komponenten der Stressreaktion aufweisen. 24 männliche Probanden durchliefen einen vollständig automatisierten bilateralen Fuß-Kaltwassertest und eine Kontrollprozedur mit warmem Wasser an zwei unterschiedlichen Tagen im Abstand von einer Woche. Die Reihenfolge von Kalt- und Warmwasser Exposition war zwischen den Probanden ausbalanciert. Speichelkortisol, kardiovaskuläre Parameter, subjektive Stress- und Erregungsbewertungen sowie EEG wurden unter Ruhe und während sowie nach der Intervention erfasst. Im Vergleich zur Kontrollbedingung ließ sich während Stressexposition ein Anstieg rechtsfrontaler Aktivierung beobachten. Dieser korrelierte stark mit kardiovaskulären Parametern der Stressreaktion, nicht aber mit subjektiven Maßen oder der Kortisolreaktion. Interessanterweise zeigte sich zudem ein Zusammenhang zwischen frontaler alpha-Asymmetrie unter Ruhe und der Kortisolreaktion auf den Kaltwassertest. Die Ergebnisse zeigen, dass akuter Stress zu einer Veränderung des emotionalen Zustands führt, der sich in frontaler kortikaler Asymmetrie widerspiegelt. Weiterhin scheinen Trait und State Komponenten frontaler alpha-Asymmetrie einen differentiellen Beitrag zur interindividuellen Variabilität der Stressreaktion zu leisten.

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NOTIZEN

**Begünstigung von Annäherungs- und Vermeidungstendenzen bei simuliertem hämorrhagischen Stress durch Integration des „Selbst“?**

Best, Daniel; Schächinger, Hartmut

Abteilung Klinische Psychophysiologie, Universität Trier

Appetitive und aversive externe Reize triggern Annäherung und Vermeidung. Unklar ist, ob Gefahr-kodierende, interne, neuronale Körper/Organ-Signale dies im Sinne einer einfachen Summation der affektiven Qualitäten oder in einer komplexen Interaktion beeinflussen. Bei 48 Probanden wurde akuter Blutverlust durch unterschiedliche LBNP-Stufen (=“Lower Body Negative Pressure“) simuliert. Aufgabe der Probanden war, in einer virtuellen 3D Umgebung möglichst rasch auf den dynamisch entstehenden emotionalen Gesichtsausdruck (glücklich vs. ängstlich) herannahender Avatare per links/rechts-Bewegung eines Joy-Sticks zu reagieren. Die Hälfte der Probanden steuerte sich selbst (= MOVE-SELF) in die virtuelle Raumperipherie, sodass der Avatar entweder zentral ins Blickfeld gerückt wurde oder aus dem Blickfeld fiel, die andere Hälfte steuerte den Avatar (= MOVE-OTHER). Es fanden sich sowohl klassische Effekte von Annäherung als auch Vermeidung. Beide Tendenzen wurden durch „Blutverlust“-Stress verstärkt, allerdings nur in der MOVE-SELF Bedingung. Diese Ergebnisse lassen sich nicht durch eine einfache Summation eines aversiven, peripheren, viszeral-neuronalen Kodes erklären. Vielmehr lassen sie vermuten, dass die Integration eines viszeral-neuronalen „Selbst“ die komplexen Annäherungs- und Vermeidungstendenzen unterstützt.

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NOTIZEN

**Effekte erhöhter noradrenerger Aktivierung durch Yohimbin auf emotionale Aufmerksamkeit bei depressiven Patienten**

Kühl, Linn; Deuter, Christian; Wingefeld, Katja; Otte, Christian

Charité Universitätsmedizin Berlin, Deutschland

Stress spielt eine wichtige Rolle für die Entwicklung und Aufrechterhaltung einer depressiven Störung. Auch für die körperlichen Stresssysteme konnten Veränderungen bei depressiven Patienten gezeigt werden. So wurde z.B. im Locus coeruleus-noradrenergen (LC-NA) System eine Aufregulierung zentraler alpha2-adrenerger Rezeptoren gefunden. Als potentieller Mechanismus hierfür wird chronischer Stress im frühen Lebensalter durch traumatische Kindheitserfahrungen wie z.B. körperlichen oder sexuellen Missbrauch diskutiert. Das LC-NA-System hat Einfluss auf die physiologische Stressreaktion und interessanterweise auch auf kognitive Funktionen. Tatsächlich konnten noradrenerge Effekte auf verschiedene kognitive Funktionen wie Aufmerksamkeit, Lernen und Gedächtnis bei gesunden Probanden bereits gezeigt werden. Neben affektiven Veränderungen sind auch Beeinträchtigungen kognitiver Funktionen wie Veränderungen der Aufmerksamkeit wichtiges Symptom einer Depression, dennoch sind mögliche Zusammenhänge von Veränderungen im LC-NA-System und kognitiven Prozessen hier kaum untersucht. Daher war Ziel dieser Studie zu untersuchen, ob eine noradrenerge Stimulation emotionale Aufmerksamkeitsprozesse bei depressiven Patienten beeinflusst. Zudem sollte die möglicherweise mediiierende Rolle der Erfahrung von Kindheitstraumata mituntersucht werden. In einer ersten Zwischenanalyse von 47 depressiven Patienten (24 mit / 23 ohne Kindheitstraumata) und 61 gesunden Probanden (26 mit / 35 ohne Kindheitstraumata) haben wir nach der Gabe von 10mg Yohimbin kürzere Reaktionszeiten bei Gesichtsreizen mit traurigem Ausdruck in einem emotionalem Dot-Probe-Paradigma gefunden. Ein Aufmerksamkeits-Bias für negative Reize wird als wichtiger aufrechterhaltender Faktor einer Depression diskutiert, wobei unsere Ergebnisse zu einem besseren Verständnis beitragen könnten für die Rolle des LC-NA-Systems - und mögliche Konsequenzen dysfunktionaler Veränderungen als Folge massiver Stresserfahrungen - als ein möglicher neurobiologischer Mechanismus für veränderte kognitive Prozesse bei depressiven Patienten.

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NOTIZEN

### 2.3.3 Examining social influences on brain and behavior across development and aging [Hörsaal A3]

Julia Magdalena Rodriguez-Buritica, FU Berlin

Human behavior is strongly shaped by social influences. The impact of these influences seem to vary across the lifespan. The research presented in this symposium will relate the impact of social influences to age-related changes in brain and behavior. Julia Rodriguez Buritica will show that children (8-10-year-olds) are highly sensitive to the example of others, particularly of their own peers, but have difficulties to use that information for learning as compared to young adults. This age-related difference will be linked to developmental changes in brain regions foremost related to cognitive control. Andrea Reiter will present research showing that in adolescents (12-15-year-olds), but not young adults, observed choices of own peers resulted in shifts in learning and decision preferences. These developmental differences will be linked to real-life factors like social integration or impulsivity. Frances Hofe-richter will relate adolescents' (14-17-year-olds) social behavior in classrooms to structural brain changes. That is, competition in the classroom and the feeling to belong to school will be associated with students' amygdala volume. Sofie Valk will present data of a longitudinal intervention study in young and older adults showing how training of social skills can affect brain structures. Her findings indicate structural plasticity in socio-affective and –cognitive brain networks based on daily training of social skills. Finally, Ben Eppinger will integrate these different results into a theoretical framework explaining lifespan changes in social learning and decision making. He will further discuss the impact of these findings for the development of an “evidence-based” science of learning approach.

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NOTIZEN

## Examining neural correlates of observational reinforcement learning across development

Rodriguez-Buritica, Julia Magdalena

FU Berlin, Deutschland

Childhood is considered an important period for social development and learning, particularly from own peers. Yet, little is known about children's learning in social situations. An important type of social learning is observational learning as it can be more beneficial than learning from own outcomes, for instance when potential outcomes are negative. In two EEG-studies and one fMRI study we investigated the behavioral and neurobiological changes underlying individual and observational learning in children (8-10 year-olds) and young adults (18-30 year-olds) using a probabilistic reward-based observational learning paradigm. Across age, the optimal option was chosen more frequently in the observational (i.e., other's actions and outcomes observable) than individual learning condition (i.e., neither actions nor the outcomes of other's observable). In children, we found enhanced event-related potentials (ERPs) as well as more pronounced imitative choice behavior when observing same-aged peers compared to young adults. Children learned more slowly than adults from peer behavior and showed difficulties to use observed outcomes for learning; as seen by enhanced medial prefrontal ERPs and no learning-related changes in parietal ERPs. Model-based parametric fMRI analyses revealed that reward (striatum) and cognitive control regions (dorsolateral and medial PFC) increased activation when other's outcomes were worse than expected. Interestingly, children showed a diminished activation to other's outcomes in the dlPFC and mPFC. Moreover, this activation mediated the age-related increase in observational learning performance. These results suggest that neural mechanisms for learning from others are prone to developmental change, which is reflected in brain regions foremost related to cognitive control.

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NOTIZEN



**Peer influences on learning and decision-making in adolescents**Reiter, Andrea<sup>1</sup>; Li, Shu-Chen<sup>1</sup>; Eppinger, Ben<sup>1,2</sup><sup>1</sup>TU Dresden, Deutschland; <sup>2</sup>Concordia University, Montreal, Canada

In general, adolescence is characterized by a high degree of physical health. Health dangers mostly emerge by decisions teenagers themselves make: Epidemiological research has found higher rates of unprotected sexual intercourse, risky driving, delinquency and experimenting with drugs in adolescence as compared to any other period in life. Previous research also emphasizes the important impact of social factors, i.e. peers, on these maladaptive behaviors. However, mechanisms which underlie the influence of peers on decision-making in adolescents are so far poorly understood.

We use two social decision-making tasks in combination with behavioral computational modeling in adolescents (12-15y) and young adults (20-32y) to investigate risk- and advice taking in teens vs. adults. In a within-subjects-design, both age groups underwent the tasks once while interacting with a peer or a player of the other age group. We investigate how social decision-making mechanisms during risk- and advice-taking differ as a function of a) our participants age group b) whether they are interacting with own-age players (“peers”) or other-age players and demonstrate how this relates to real-life factors like social integration or impulsivity.

Social decision-making paradigms in combination with computational modeling of behavior appear as a promising step to fine-grain our understanding of the often times postulated “social brain in adolescence”. It might prove useful for clinical and educational purposes, to define risk factors for predicting maladaptive behaviors and to inform programs to prevent them.

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NOTIZEN

## How helpfulness, competition in the classroom and school belonging shape students' amygdala volume

Hoferichter, Frances<sup>1</sup>; Lorenz, Robert C.<sup>2</sup>; Romund, Lydia<sup>3</sup>; Pelz, Patricia<sup>3</sup>; Golde, Sabrina<sup>3</sup>; Gleich, Tobias<sup>3</sup>; Beck, Anne<sup>3</sup>; Raufelder, Diana<sup>1</sup>

<sup>1</sup>University of Greifswald, Germany; <sup>2</sup>Max Planck Institute for Human Development, Center for Adaptive Rationality, Berlin, Germany; <sup>3</sup>Department of Psychiatry and Psychotherapy, Charité – Universitätsmedizin Berlin, Deutschland

The amygdala, known to be the central network of emotions, plays an essential role when handling social relationships. Over the last decade, researchers have been interested in the impact of environmental factors on the human brain, such as supportive social relationships, which satisfy humans' desire of belonging to a social group. Recent studies found that social support (e.g., companionship, advice, emotional and practical support) was negatively related to amygdala volume in older adults (60 to 78 years). However, it is not clear how social support in adolescent students might be related to their amygdala volume. Particularly, as school represents one of the most essential developmental contexts during adolescence, the question arises whether social support in school, i.e. helpfulness (an indicator of social support) and competition (an indicator of non-social support) in class as well as the feeling to belong to school are related to students' amygdala volume. In the present study, 75 secondary school students (41% girls) from Brandenburg, Germany ages 14-17 ( $M_{age} = 15.26$ ,  $SD = .43$ ) participated in a questionnaire as well as a magnetic resonance (MR) imaging study in 2014. We applied voxel-based morphometry to analyze the grey matter volume of the amygdala. Combining both MRI and questionnaire data, the multiple regression analysis revealed that competition in the classroom was positively whereas school belonging was negatively related to amygdala volume. However, helpfulness in class was not significantly related to amygdala volume. Our findings indicate that even non-social support (i.e., competition in class) may be associated with students' amygdala volume.

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NOTIZEN

## Training the social brain

Valk, Sofie.<sup>1,2,3</sup>

<sup>1</sup>Max Planck Institute for Human Cognitive and Brain Sciences, Germany;

<sup>2</sup>Heinrich Heine Universität Düsseldorf, Deutschland; <sup>3</sup>FZ Juelich, INM-7, Deutschland

Humans are a highly social species and social competences are highly important for survival. Numerous psychological and developmental studies suggest that social skills can largely be sub-divided in socio-affective and socio-cognitive components. An example of a socio-affective state is empathy and an example of socio-cognitive processes is Theory of Mind (ToM).

Neuroimaging studies have offered keen insights into brain regions involved in social cognitive processes, both at the level of regions and networks, inter-individual differences and clinical populations. An important open question is if and how social skills can change by training, and whether this would affect the structure of the brain. Based on a longitudinal intervention study, the ReSource study, we contrasted the effects of targeted socio-cognitive and socio-affective training on behavioral measures as well as on brain structure in a large sample of adults (20-55y). Training protocols addressed three different domains: mindful-attention and interoception, socio-affective skills such as compassion, and socio-cognitive skills. All training was secular, and trained every day of the week by means of mobile phone exercises combined with a weekly in-house teacher-led training in small groups. Across different studies, we observed that socio-cognitive and socio-affective training have differential effects of behavior and on brain structure. These findings suggest that training social skills is indeed possible and alters brain and behavior. The findings could help develop and inform targeted mental training programs in clinical and educational settings aiming at cultivating social intelligence and cooperation.

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NOTIZEN

**Developmental and ageing-related changes in social learning and decision-making: A push towards integration of findings and potential applications**

Eppinger, Ben<sup>1,3</sup>; Rodriguez-Buritica, Julia<sup>2</sup>; Reiter, Andrea<sup>3</sup>

<sup>1</sup>Concordia University, Montreal, Kanada; <sup>2</sup>Freie Universität Berlin, Germany; <sup>3</sup>TU Dresden, Germany

The research presented in this symposium shows that the impact of social influences on learning and decision preferences changes substantially across the lifespan. For example, in children negative feedback that is received from peers seems to have a greater impact on learning than feedback that is received from adults and these social effects are reflected in activity differences in the medial prefrontal cortex. During adolescence, observed behavior in peers, but not adults, results in shifts in learning and decision preferences. Finally, in older adults there is evidence for impairments in socio-cognitive processes, but also for preservation of function, for example when it comes to socio-affective processes such as empathy and compassion. Moreover, recent findings suggest that these social skills in older adults can be trained and that training effects can be observed in behavior as well as brain structure. In this talk, I will try to contextualize these different findings with the aim of developing a coherent theoretical framework to explain lifespan developmental changes in social learning and decision-making. I will also try to reach out to educational sciences to see what the impact of these findings could be for the development of an “evidence-based” science of learning approach.

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NOTIZEN

### 2.3.4 Take good care and keep track: Die alltagsnahe Erforschung gesundheitsrelevanter Verhaltensfaktoren [Hörsaal A4]

Nadine Skoluda, Universität Wien

Jana Strahler, JLU Gießen

Die Erforschung von gesundheitsrelevanten Faktoren, d.h. gesundheitsschädliche und -förderliche Verhaltensweisen und Personeneigenschaften, sowie deren zugrundeliegenden biologischen Mechanismen stellen wichtige Schwerpunkte in der klinischen und Public Health Forschung dar. Bisherige Forschungsbefunde basieren vorwiegend auf querschnittlichen Studien, die einmalig erfasste gesundheitsrelevante Faktoren mit Gesundheits- und Krankheitsmaßen in Verbindung setzen. Ambulante Assessmentstudien ermöglichen durch wiederholtes Messen im Feld ökologisch valide Aussagen über gerichtete Zusammenhänge zwischen interessierenden Gesundheitsfaktoren, Gesundheitsoutcomes und zugrundeliegenden biologischen Mechanismen im Alltag von Gesunden und Patienten-Populationen.

Das eingereichte Symposium möchte zu einem besseren Verständnis möglicher Effekte und Mechanismen von gesundheitsrelevanten Faktoren beitragen. Schwerpunkt wird dabei auf gesundförderliche Faktoren gelegt, die potentiell präventiv/ intervenierend zur Gesundheitsförderung eingesetzt werden können. Alle Beiträge basieren auf ambulanten Assessmentstudien (1-14 Tage). Im ersten Beitrag (Jana Strahler, Gießen) werden an gesunden Erwachsenen Zusammenhänge verschiedener gesundheitsrelevanter Faktoren (physische Aktivität, Ernährung, Schlaf, Musikhören, Respekterleben) mit Wohlbefinden (Stimmung, Stresserleben, Erschöpfung) und Stress-Biomarkern (Cortisol, Alpha-Amylase im Speichel) untersucht. Der zweite Beitrag (Johanna M. Doerr, Marburg) ist eine placebokontrollierte Studie, die den Zusammenhang zwischen erlebter Partnernähe, Partnerinteraktionsqualität und Schlafqualität/ -dauer unter nasaler Oxytocin-Verabreichung untersucht. Der dritte Beitrag (Andreas R. Schwerdtfeger, Graz) untersucht Zusammenhänge zwischen momentan erlebter Resilienz und Herzratenvariabilität bei Feuerwehreinsatzkräften während eines Einsatztages. Der vierte Beitrag (Anja C. Feneberg, Wien) beschäftigt sich mit der Frage, wie Musikhören und Musikmerkmale mit Stimmung, Stresserleben und Stress-Biomarkern (Cortisol, Alpha-Amylase im Speichel) von depressiven Patientinnen zusammenhängen. Die hier präsentierten Beiträge geben weitere Hinweise für die Bedeutung unterschiedlichster gesundheitsrelevanter Faktoren und unterstreichen die Relevanz und das Potential von ambulanten Assessmentstudien für die Forschung.

## Schlaf, Musik und Respekt: Eine ambulante Assessment-Studie zum Zusammenhang von Gesundheitsfaktoren, Wohlbefinden und Stressmarkern

Strahler, Jana<sup>1</sup>; Nater, Urs M.<sup>2</sup>; Skoluda, Nadine<sup>2</sup>

<sup>1</sup>Justus-Liebig-Universität Gießen, Deutschland; <sup>2</sup>Universität Wien, Österreich

Befunde aus querschnittlichen und experimentellen Untersuchungen bestätigen die Effekte verschiedener Verhaltensweisen, wie z.B. physische Aktivität, ein regelmäßiger Schlaf und gesunde Ernährung, auf Gesundheit und Wohlbefinden. Allerdings bleibt der Anteil an Varianz, der durch diese Faktoren aufgeklärt wird, überschaubar. Zur weiteren Klärung bedarf es Studien, die unter ökologisch validen Bedingungen sowie unter Beachtung zeitlicher Fluktuationen verschiedene Gesundheitsfaktoren untersuchen. Neben traditionellen Faktoren (Aktivität, Schlaf, Ernährung) sollen in dieser Studie auch Musikhören und positive soziale Interaktionen betrachtet werden.

Im Rahmen einer ambulanten Assessment-Studie machten insgesamt 77 gesunde Erwachsene (38 Frauen,  $23.9 \pm 4.5$  Jahre,  $22.0 \pm 2.8$  kg/m<sup>2</sup>) Angaben zu Stimmung, Stress, Erschöpfung (als Indikatoren für Wohlbefinden), wahrgenommenem Respekt und physischer Aktivität (5 x/Tag für 4 aufeinanderfolgende Tage). Jeden Morgen schätzten die Teilnehmer die Erholbarkeit ihres Schlafes ein. Am Ende des Tages wurden zusätzliche Informationen zum täglichen Kaffee-, Alkohol- und Gemüse/Obst-Konsum sowie Musikhörverhalten erhoben. Zur Erfassung biologischer Stressmarker (Cortisol, Alpha-Amylase) wurde parallel zu jeder Abfrage eine Speichelprobe gesammelt.

Vor allem ein erholsamer Schlaf, Respekterleben und Musikhören standen im Zusammenhang mit einem verbesserten Wohlbefinden. Zusammenhänge mit dem täglichen Konsum von Kaffee, Alkohol oder Obst und Gemüse spielten eine eher untergeordnete Rolle. Ein verstärktes Erleben von Respekt war assoziiert mit verringerten Cortisol-Konzentrationen über den Tag; Kaffeekonsum führte zu erhöhten Tageswerten beider Stressmarker. Selbstberichtete physische Aktivität zeigte sich weder mit den subjektiven noch biologischen Maßen assoziiert.

Unsere Ergebnisse liefern wichtige Erkenntnisse zu potentiellen Ressourcen eines gesteigerten Wohlbefindens. Vor allem die Zusammenhänge mit Schlaf, Musikhören und Respekterleben sind vielversprechend und gilt es nun in längsschnittlich angelegten Studien intensiver zu untersuchen.

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NOTIZEN

## Oxytocin und Schlaf im Alltag von Paaren

Doerr, Johanna M.<sup>1</sup>; Klaus, Kristina<sup>1</sup>; Nater, Urs M.<sup>2</sup>; Ditzen, Beate<sup>3</sup>

<sup>1</sup>Fachbereich Psychologie, Philipps-Universität Marburg, Deutschland; <sup>2</sup>Klinische Psychologie des Erwachsenenalters, Universität Wien, Österreich; <sup>3</sup>Institut für medizinische Psychologie im Zentrum für Psychosoziale Medizin, Universitätsklinikum Heidelberg, Deutschland

Da die meisten Menschen ein Bett mit ihrem Partner teilen, sind Wechselwirkungen zwischen Aspekten der Partnerschaftsqualität und Schlaf wahrscheinlich sehr wichtig für die Gesundheit, wurden bisher aber nur unzureichend untersucht. Auf biologischer Ebene könnte hier das Neuropeptid Oxytocin eine modulierende Wirkung haben, da es eng mit Bindungsverhalten in Zusammenhang steht und auch Effekte auf den Schlaf nachgewiesen wurden.

An der Alltagsuntersuchung nahmen 80 heterosexuelle Paare teil (Alter  $28 \pm 5$  Jahre). Über 5 aufeinanderfolgende Tage beantworteten sie zu 6 Messzeitpunkten täglich Fragen per iPod und nahmen 2x täglich ein Nasenspray (doppelblind N=40 Paare Oxytocin, N=40 Paare Placebo). An 4 Messzeitpunkten täglich schätzten die Paare zudem die empfundene Nähe zum Partner sowie die Qualität der Paarinteraktion ein. Weiterhin machten sie morgens Angaben zur Schlafqualität und -dauer. Die statistische Auswertung erfolgte mit multiplen Regressionsmodellen.

Es zeigte sich ein positiver Zusammenhang zwischen der empfundenen Nähe zum Partner/zur Partnerin und der Schlafqualität ( $\beta=0.28$ ,  $p<.001$ ). Weder zwischen empfundener Nähe und Schlafdauer, noch zwischen Interaktionsqualität und Schlafqualität oder -dauer fanden sich Zusammenhänge. Die Personen in der Oxytocin-Gruppe gaben an, besser zu schlafen ( $\beta=0.18$ ,  $p=.011$ ), die Schlafdauer unterschied sich nicht zwischen den Gruppen. In der Oxytocin-Gruppe war der Zusammenhang zwischen Nähe und Schlafqualität stärker als in der Placebo-Gruppe (Interaktionseffekt  $\beta=1.03$ ,  $p=.029$ ).

Unsere Ergebnisse sprechen dafür, dass eine Erhöhung der empfundenen Nähe bei Paaren zur Verbesserung der Schlafqualität beitragen könnte. Auch der moderierende Effekt von Oxytocin auf den Zusammenhang zwischen empfundener Nähe und Schlafqualität könnte wichtige Implikationen für die Therapie von Schlafstörungen haben.

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NOTIZEN:

## **Resilienz und kardiale Aktivierung bei Feuerwehreinsatzkräften während eines Arbeitstages: Ein ambulanter Ansatz mit Bayescher Mehrebenenmodellierung**

Schwerdtfeger, Andreas<sup>1</sup>; Dick, Katharina<sup>2</sup> <sup>1</sup>Karl-Franzens-Universität Graz, Österreich; <sup>2</sup>Universität Wuppertal

Resilienz kennzeichnet einen dynamischen Anpassungsprozess an Stressoren und gilt als gesundheitsprotektive Ressource. Obgleich Resilienz häufig als dispositionelle Variable gesehen wird, scheint sie auch situativen Einflüssen zu unterliegen und spiegelt einen gelungenen Anpassungsprozess wider, der nicht i.S. einer Persönlichkeitsdisposition interpretiert werden sollte. In dieser Studie wurde Resilienz per Fragebogen (RS-25; Wagnild & Young, 1993) und im Rahmen eines ambulanten Assessments im Alltag von 38 männlichen Feuerwehreinsatzkräften (mittleres Alter: 32.7 Jahre) erfasst und mit kardialer Aktivierung (Herzrate, Herzratenvariabilität) in Beziehung gesetzt. Stressreiche Einsätze (z.B. Rettungsdienst, Einsatz mit Atemmasken; 40.2% der Einsätze), weniger stressreiche Einsätze (z.B. Routineeinsätze ohne akute Bedrohung; 59.8% der Einsätze), Dienst in der Einsatzstelle (z.B. Verwaltungsaufgaben, Fahrzeugwartung) und eine standardisierte Ausgangslage von 10 Minuten Dauer) wurden spezifiziert. Momentaner negativer Affekt, Resilienz und HRV (im Zeit- und Frequenzbereich) wurden wiederholt über einen Einsatztag hinweg (24 Stunden) aufgezeichnet und mittels Bayescher Mehrebenenmodellierung analysiert. Im Durchschnitt bearbeiteten die Untersuchungspersonen 16 ambulante Abfragen (12% davon während stressreicher Einsätze). Ambulant erfasste resiliente Einstellungen waren signifikant positiv mit der RS-25 assoziiert ( $r = .58$ ,  $p < .001$ ), jedoch war die RS-25 nicht mit kardialer Aktivierung im Alltag assoziiert. Jedoch zeigte sich auch nach Kontrolle verschiedener konfundierender Variablen (Alter, Rauchen, körperliche Aktivität, Körperkonstitution), dass ambulant erfasste Resilienz eine verminderte HRV in stressreichen Einsätzen vorhersagte. Die Daten lassen vermuten, dass resiliente Episoden in stressreichen Alltagssituationen mit einem vagalen Rückzug einhergehen, was als adaptive Reaktion interpretiert werden könnte.

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NOTIZEN



## **Eine ambulante Assessmentstudie zur Untersuchung des Musikhörverhaltens und der Einflüsse des Musikhörens auf Stimmung und Stress bei depressiven Frauen**

Feneberg, Anja C.<sup>1</sup>; Mewes, Ricarda<sup>2</sup>; Dörr, Johanna M.<sup>3</sup>; Nater, Urs M.<sup>1</sup>

<sup>1</sup>Klinische Psychologie des Erwachsenenalters, Fakultät für Psychologie, Universität Wien, Österreich; <sup>2</sup>Forschungs-, Lehr- und Praxisambulanz, Fakultät für Psychologie, Universität Wien, Österreich; <sup>3</sup>Klinische Biopsychologie, Fakultät für Psychologie, Philipps-Universität Marburg, Deutschland

Hintergrund: Musikhören wird von vielen Personen eingesetzt, um die eigene Stimmung zu regulieren. Vorausgehende Forschungsergebnisse deuten zudem darauf hin, dass alltägliches Musikhören bei gesunden Individuen mit geringerem Stresserleben und geringeren biologischen Stresswerten einhergeht. Bislang fehlen jedoch Studien, die Musikhörverhalten sowie Zusammenhänge des Musikhörens zur alltäglichen Stimmung und zu Stressmarkern bei depressiven Personen erforschen.

Methode: Im Rahmen einer ambulanten Assessmentstudie wurden 29 depressive Frauen über einen Zeitraum von zwei Wochen zu fünf Messzeitpunkten pro Tag zu aktueller Stimmung (Erregungsniveau, Valenz, Ausgeglichenheit), aktuellem Stresserleben, sowie zum Musikhörverhalten seit der letzten Messung befragt. Wurde Musikhören angegeben, so wurden weitere Fragen zu Musikmerkmalen (Valenz, Arousal) und zu Gründen des Musikhörens gestellt. Zusätzlich gaben die Probandinnen zu jeder Messung Speichelproben für die spätere Analyse von Stressmarkern (Cortisol, Alpha-Amylase) ab. Hierarchisch lineare Modelle wurden zur Untersuchung der potentiellen Effekte des Musikhörens auf die Outcome-Maße gerechnet.

Ergebnis: Vorausgehendes Musikhören wurde zu 16.5% der 2030 möglichen Zeitpunkte berichtet. Bei Kontrolle auf autoregressive Einflüsse der jeweiligen Stimmungsvariablen zeigte sich, dass Musikhören ein erhöhtes Erregungsniveau vorhersagte. Bei der Analyse der Musikhörepisoden zeigte sich ein positiver Zusammenhang zwischen musikalischer Valenz und Stimmungsvalenz sowie zwischen musikalischer Valenz und Ausgeglichenheit. Gründe des Musikhörens (Aktivierung, Entspannung, Ohne Grund) zeigten differentielle Zusammenhänge zu verbesserter Stimmung und Ausgeglichenheit, jedoch nicht zum Erregungsniveau. Die Analysen subjektiver und biologischer Stressindikatoren sind in Bearbeitung und werden anlässlich der Konferenz präsentiert.

Ausblick: Die Ergebnisse deuten darauf hin, dass Hören von Musik stimmungsregulierende Effekte bei depressiven Frauen haben kann und folglich

zur effektiven und selbstbestimmten Veränderung der Stimmung eingesetzt werden kann.

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NOTIZEN

### 2.3.5 Neuro-cognitive computational models of reading and visual word recognition [Hörsaal A5]

Benjamin Gagl, Jona Sassenhagen, Goethe Universität Frankfurt a. Main

Reading is the rapid ( $\sim 300$  words per minute) decoding of complex orthographic code to access the meaning of written texts. Computational models describing the cognitive processes underlying this task have a long tradition in successfully implementing and evaluating theoretical accounts for visual word recognition and reading behavior – granting significant scientific progress. Neuroimaging data allows explicitly testing theoretical assumptions underlying cognitive models – with limited success. On the contrary the novel insights from neuroimaging data have motivated researchers to develop the first neuro-cognitive models, derived by combining neural data with functional theories of reading. Here, four talks will present novel neuro-cognitive computational accounts of reading. The first talk, by Françoise Vitu, will show how the implementation of saccade-programming principles in the superior colliculus allows to simulate scan paths in natural reading. Then, Benjamin Gagl will show how sensory information optimization in reading is realized at a neuronal level and the resulting consequences for cognitive processes leading to visual word recognition. Next, Jona Sassenhagen will connect electrophysiological correlates of reading to brain-inspired “deep” neural network models capable of visual word recognition – mapping artificial network stages to the time course of reading in the human brain, from low-level visual features to meaning. In the fourth talk, Markus Hofmann will present a model predicting semantic top-down activation in the ventral stream during visual word recognition. These presentations, spanning from scan paths to access of semantic information, provide an update on current approaches and connect cognitive and neuro-cognitive theoretical accounts of reading.

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NOTIZEN

**Reading with an illiterate brain: Evidence for mindless eye-movement control**

Vitu, Françoise<sup>1</sup>; Adeli, Hossein<sup>2</sup>; Zelinsky, Gregory J.<sup>2</sup>

<sup>1</sup>Laboratoire de Psychologie Cognitive, CNRS, Aix-Marseille Université, Marseille, France; <sup>2</sup>Department of Psychology, Stony Brook University, Stony Brook, NY, USA

Over the past thirty years, a great number of computational models have been proposed to account for eye-movement control during reading. Yet, despite their high prediction performance, these models fail to recognize fundamental principles of saccade programming in the Superior Colliculus (SC), while overstating the contribution of top-down, language-related or strategy-based, guidance. MASC, our Model of Attention in the Superior Colliculus, predicts successive eye-fixation locations during reading, only based on extraction of luminance-contrast signals (or visual saliency), combined with well-established spatial-integration principles in the distorted space of the SC (i.e., cascaded averaging of input signals over translation-invariant neuronal populations in visual and motor maps). Its oculomotor behavior, while viewing sentences from the French Sentence Corpus, was nearly indistinguishable from the behavior of human adults reading those sentences for comprehension. In particular, MASC reproduced the five most robust, word-based, eye-movement patterns, which have been interpreted as evidence for top-down guidance. While demonstrating that eye-movement control during reading is largely mindless, MASC delimitates, through its few failures, the small perimeter of language-related influences. As a model of the SC, a highly integrative structure, MASC has the potential to become a full, neurobiologically plausible, model of reading that also integrates one-off top-down modulations.

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NOTIZEN

**Visual word recognition relies on a sensory prediction error signal**

Gagl, Benjamin; Fiebach, Christian J.

Goethe Universität Frankfurt am Main, Deutschland

Neurophysiological evidence suggests energy-efficient visual processing. Taking this constraint into account, we developed an orthographic prediction model of reading according to which redundant perceptual input is “predicted away” so that subsequent stages of word recognition are based on an optimized representation: the orthographic prediction error (oPE). In detail, we realized a prediction by estimating a pixel-wise mean from overlaid images that present all words from a lexicon and calculated a oPE representation for each word by subtracting the prediction from each individual word, thereby achieving an information reduction of  $\sim 41\%$ . Interestingly, the oPE reflects orthographic familiarity in a pure form, since the oPE is associated to orthographic word-characteristics (e.g. Orthographic neighborhood) without a relation to higher-level lexical concepts (e.g. Word frequency). In addition, we found in four behavioral datasets (lexical decision tasks from English, French, Dutch and German; all  $N$ 's  $> 53$ ) that reaction times were positively associated with oPE (faster reaction for words with low oPE and vice versa). In an fMRI dataset (silent reading;  $N=39$ ) we found the same oPE effect localized to bi-lateral occipital cortex. Using EEG (silent reading;  $N=31$ ), we observed that the oPE predicted the amplitude of the ERP around 170 ms. In a final evaluation we investigated the readability of handwritings and found that low oPE handwritings were more readable. Combined, these findings suggest that in single-word reading, i.e., in the absence of contextual constraint, visual information is optimized by a word-knowledge prediction providing an optimal representation for efficient lexical access.

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NOTIZEN

**From pixels to semantic features: directly encoding a reading-capable artificial neural network in brain activity entails distributed coding**

Sassenhagen, Jona; Fiebach, Christian J.

Goethe University Frankfurt, Deutschland

How is the representational space of word knowledge organised? Traditional “boxes-and-arrows” models proclaim a modular, i.e. compartmentalised approach, whereas connectionist/distributionist proposals suggest shared representational spaces of form and meaning. Relying on off-the-shelf machine learning tools, we train a deep convolutional neural network to read words - to access word semantics based on low-level visual input. Investigating the network’s hierarchically layered structure, we observe that earlier layers contain information about visual features, late layers have learned semantic representations; importantly, intermediate layers have autonomously learned an orthography-like code. Encoding the representations developed by this neural network activity in real brain activity, we find that lower layers predict early brain activity, intermediate layers predict intermediate brain activity, and late layers intermediate and late brain activity. In particular, we observe that, instead of a strictly modular organisation, orthographic and semantic representations are reflected in adjacent and overlapping neural codes. In sum, both the internal architecture of our reading-capable artificial neural network, as well as corresponding neural events indicate a shared representational space of (abstract) form and meaning.

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NOTIZEN

**Simulating semantic priming to predict ventral visual stream activation**

Hofmann, Markus J.

Bergische Universität Wuppertal, Deutschland

While previous Interactive Activation Models so far lacked a fully implemented semantic layer, the Associative Read-Out Model (AROM) defines associations between all words using the log likelihood that they occur more often together in the sentences of a huge corpus than predictable by single word frequencies. We tested whether this architecture predicts associative priming due to a direct associative link between prime and target, and semantic priming by indirect associative activation spreading across common semantic feature words. In line with the classic behavioral priming literature, we found reliable semantic priming effects primarily at an SOA of 200 ms, and more reliable associative priming effects at a long SOA of 1000 ms. When we tested the neurocognitive model-to-data connections proposed in Hofmann and Jacobs (2014, NBR), we found that common associations pre-activate occipital, left fusiform, temporal, inferior frontal and mediofrontal regions, thus suggesting semantic top-down excitation down to the lowest levels of representation in the ventral visual stream

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NOTIZEN

## 2.4 Postersession II; 14:45 - 16:15 Uhr [Foyer]

### **01** Stress sharpens category boundaries by enhancing the generalization of in-category items and the discrimination of out-category items

Paul, Marcus<sup>1,4</sup>; Fellner, Marie-Christin<sup>2</sup>; Waldhauser, Gerd T.<sup>2</sup>; Suchan, Boris<sup>3</sup>; Axmacher, Nikolai<sup>2</sup>; Wolf, Oliver T.<sup>1</sup>

<sup>1</sup>Cognitive Psychology, Ruhr-University Bochum, Deutschland; <sup>2</sup>Neuropsychology, Ruhr-University Bochum, Deutschland; <sup>3</sup>Clinical Neuropsychology, Ruhr-University Bochum, Deutschland; <sup>4</sup>International Graduate School of Neuroscience (IGSN), Ruhr-University Bochum, Deutschland

Stress triggers a series of neuroendocrine processes that influence cognitive abilities from visual perception to learning and memory. In a previous study, we found that stress influences neural oscillations during categorization learning, whereas the overall behavioural performance was not influenced. In the current study, we investigate the influence of stress-related changes in the neural correlates of categorization learning on the retrieval and generalization of categories.

Participants underwent the stressful socially-evaluated cold pressor test - (SECPT) or a control condition before they conducted a two-day categorization learning paradigm. The EEG was recorded on both days of the paradigm. During the acquisition phase on day one, participants learned to categorize pictures of bugs into four categories. Each category was characterized by a combination of two features (e.g. body shape and legs). One day later, participants conducted a retrieval test. Besides old stimuli from the acquisition phase, new stimuli were presented, which had either two (new bugs), one (lures), or none (distractors) of the features that characterized a category.

Preliminary analyses of the data suggest that whereas stress had no influence on the acquisition of the categories, stress appears to enhance categorization performance of the new bugs during retrieval. Furthermore, stressed participants more accurately distinguished lures and distractors from category members. In the EEG, spectral characteristics will be investigated, and representational similarity analyses will be performed. The results of the current study suggest a sharpening of category boundaries after pre-learning stress. The electrophysiological category representations will be discussed as neural basis of this effect.

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NOTIZEN:



**02** Attentional Bias Modification in Social Anxiety: Effects on the N2pc Component

Reutter, Mario<sup>1</sup>; Hewig, Johannes<sup>1</sup>; Wieser, Matthias J.<sup>2</sup>; Osinsky, Roman<sup>3</sup>

<sup>1</sup>University of Würzburg, Germany; <sup>2</sup>Erasmus University Rotterdam, Netherlands; <sup>3</sup>University of Osnabrück, Germany

Several meta-analyses to date have confirmed the efficacy of attentional bias modification (ABM) in shifting reaction times away from threatening stimuli, reducing anxiety symptoms, and buffering against stressor vulnerability. The reliability of reaction time differences, however, has been found to be unacceptable for psychometry. In this study, we tested the impact of an extensive Dot-Probe ABM procedure, consisting of close to 7000 trials, concurrently with behavioral and electrophysiological measures within a large sample of over 100 highly socially anxious participants. Results indicated that the N2pc component demonstrates more statistical power and more internal consistency in detecting attentional biases and their modification than reaction time (RT) differences. RTs were neither indicative of an attentional bias before ABM nor of a modification over time. In contrast, the N2pc indexed both an initial attentional preference for threatening stimuli and an alteration of this relationship after training. Outcomes were not specific for attentional training away from threat but also occurred in the no-contingency control procedure, casting doubt on the theoretic underpinnings of ABM. Electrophysiological measures are an important complement to the ABM literature and should be further utilized to assess attentional biases with excellent reliability.

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NOTIZEN:

**03** Read my face: Automatic video-based coding versus electromyographic measurement of facial reactions toward emotional pictures

Höfling, Tim<sup>1,2</sup>; Gerdes, Antje<sup>1</sup>; Föhl, Ulrich<sup>2</sup>; Alpers, Georg W.<sup>1</sup>

<sup>1</sup>Universität Mannheim, Deutschland; <sup>2</sup>Hochschule Pforzheim, Deutschland

Being able to read facial expressions provides insight into a person's emotional experience. There has been tremendous progress in automatic facial coding (AFC) which enables researchers to automatically decode emotional facial expressions with impressive accuracy in standardized emotion displays. We tested the sensitivity of a well-established AFC software (Facereader 7.0; Noldus, 2017) to detect spontaneous emotional reactions in individuals who respond to emotional pictures. We compared automatically generated scores for valence and arousal with the current gold standard, i.e., psychophysiological indicators of emotional valence (Facial Electromyography, fEMG) and arousal (Skin Conductance, SC). 43 participants completed a picture viewing task with pleasant, unpleasant, and neutral scenes. When participants smile in response to positive pictures AFC Valence is a comparably sensitive measure as fEMG. However, for unpleasant emotions AFC Valence did not detect changes as well, but they resulted in substantial changes in fEMG. Furthermore, AFC measures of arousal were uncorrelated with self-rated emotional arousal while SC was sensitive. This is the first study to document AFC measurement of spontaneous emotional reactions toward standardized emotional pictures. This novel technology has yet to make strides to surpass the sensitivity of established psychophysiology, but it is a promising new measurement alternative for non-contact assessment of emotional responses.

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NOTIZEN:

**04** Strengthening effect of stress on conditioned fear memories

Klinke, Christopher M.<sup>1</sup>; Fiedler, Dominik<sup>2</sup>; Lange, Maren D.<sup>2</sup>; Andreatta, Marta<sup>1</sup>

<sup>1</sup>Department of Psychology I, University Würzburg, Germany; <sup>2</sup>Institute for Physiology I, University of Münster, Germany

This study was funded by the collaborative research center SFB/TRR 58, Project B08

Previous animal and human studies demonstrated stress effects on fear conditioning. However, there are methodological differences (i.e., timing of stress induction) between the two. While in human studies, stress is applied directly prior or after learning, in animal models stress precedes learning by days. For example, a study in rodents found impaired extinction after stress induction 10 days before fear acquisition. The aim of the study was to translate these findings into humans. Seventy participants underwent fear acquisition and extinction on two consecutive days. During acquisition, one geometrical shape (conditioned stimulus, CS+), but not another one (CS-), was paired with an electric stimulus (unconditioned stimulus, US). Extinction was identical, but without US-delivery. Ten days before acquisition, participants were randomly divided into three groups: A stress group A (socially evaluated cold-pressor test; SECPT), a sham procedure group in the same context as acquisition or a stress group B in a different context. Successful fear acquisition was evident in startle potentiation, larger skin conductance responses and aversive ratings for CS+ vs. CS-. Decreasing discriminative responses indicated extinction. Interestingly, the stress group A showed impaired extinction in the ratings. In sum, pre-dating stress may strengthen fear memories and thereby impair extinction in humans. Importantly, the context boosted such effects.

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NOTIZEN:

**05 Molekulargenetische Grundlagen von Lebenszufriedenheit: Ergebnisse einer Assoziationsstudie auf Grundlage der Befunde einer genomweiten Assoziationsstudie (GWAS)**

Lachmann, Bernd<sup>1</sup>; Doeblner, Anna<sup>2</sup>; Sariyska, Rayna<sup>1</sup>; Sindermann, Cornelia<sup>1</sup>; Montag, Christian<sup>1,3</sup>

<sup>1</sup>Universität Ulm, Ulm, Deutschland; <sup>2</sup>Universität Mannheim, Mannheim, Deutschland; <sup>3</sup>University of Electronic Science and Technology of China, Chengdu, China

In einer kürzlich durchgeführten genomweiten Assoziationsstudie (GWAS) wurden drei Genvarianten in einer Stichprobe von  $N = 298,420$  identifiziert, die mit subjektivem Wohlbefinden in Verbindung gebracht werden. Die Messung von subjektivem Wohlbefinden wurde durch die Komponenten Lebenszufriedenheit und positiven Affekt operationalisiert. In der vorliegenden Studie wurden die drei identifizierten Genvarianten (RAPGEF6, rs3756290; CSE1L, rs2075677; NMUR2, rs4958581) im Bezug auf ihren Zusammenhang mit Lebenszufriedenheit und positivem Affekt erneut untersucht. Darüber hinaus sollten Befunde einer weiteren Studie zum Zusammenhang von 5-HTTLPR/rs25531 und Lebenszufriedenheit repliziert werden.

Es wurden insgesamt  $N = 1174$  Teilnehmer ( $N = 821$  Frauen) im Alter von 18 bis 65 Jahren ( $M = 23.48$ ,  $SD = 7.11$ ) in einer Online-Studie unter anderem zu ihrer allgemeinen Lebenszufriedenheit und ihrem positiven Affekt („Positive Affect Negative Affect Scale“) befragt. Außerdem wurden Informationen zu den spezifischen Bereichen von Lebenszufriedenheit Gesundheit, Beruf, Einkommen, Wohnung, Freizeit und Familie erfasst. Die Fragen zur Lebenszufriedenheit stammen aus dem sozio-ökonomischen Panel (SOEP).

Es wurden keine Zusammenhänge zwischen den drei oben genannten Genvarianten (GWAS) und allgemeiner Lebenszufriedenheit oder positivem Affekt gefunden. Auch zwischen keinem der oben genannten spezifischen Bereiche von Lebenszufriedenheit und den drei untersuchten Genvarianten zeigte sich ein Zusammenhang. Für 5-HTTLPR/rs25531 gab es einen Zusammenhang mit Lebenszufriedenheit, wobei für L'L'-Träger (LA/LA) im Vergleich zu S'S'-Trägern (SA/SA, LG/SA) signifikant höhere Zufriedenheitswerte in den Bereichen Freizeit und Familie sowie allgemeiner Lebenszufriedenheit gefunden wurden. Es ist erwähnenswert, dass dieser Zusammenhang in Hinblick auf eine soziodemographisch ausgewogenere Teilstichprobe (Geschlecht, Alter und Bildung) deutlich sichtbarer war als in der kompletten Stichprobe.

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NOTIZEN:

**06 Effects of right temporal lobe resection on visual emotion processing: An ongoing fMRI study**

Stieghorst, Lea Marie<sup>1</sup>; Mehlmann, Alexandra<sup>2,3</sup>; Wegrzyn, Martin<sup>2,3</sup>; Wörmann, Friedrich<sup>1</sup>; Kissler, Johanna<sup>2,3</sup>; Bien, Christian G.<sup>1</sup>

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Emotionally arousing visual stimuli trigger increased blood oxygenation level-dependent (BOLD) signal in brain areas involved in visual processing compared to neutral stimuli. One explanation for these emotion effects is the modulation of visual pathways by feedback originating in the amygdala. To test this hypothesis, we investigated visual emotion processing of different stimulus categories in up to now eight patients (five female,  $M = 41.38$  ( $SD=12.27$ ) years old) with right unilateral temporal lobe resection comprising amygdala and hippocampus due to temporal lobe epilepsy and eight healthy participants (five female,  $M = 38.35$  ( $SD=12.06$ ) years old). In a passive viewing functional magnetic resonance imaging paradigm, we measured the BOLD response for negative compared to neutral scenes, faces, and words. In healthy participants, negative scenes induced enhanced activation in the bilateral lateral occipital cortex, left fusiform and right inferior temporal gyrus, whereas in patients increased response was observed only in the left inferior temporal gyrus. For faces, emotional activation in healthy participants comprised typical face processing areas such as the bilateral lateral occipital cortex and superior temporal sulcus, right fusiform and inferior temporal gyrus. In patients, increased activation was restricted to the left fusiform gyrus. For negative words neither healthy participants nor patients showed differential activations. Taken together, our results suggest that right medial temporal lobe structures are important, but not sole generators of visual processing enhancement for emotional stimuli, as ipsilesional responses to negative visual stimuli are reduced and less widespread after right amygdala resection, but relatively preserved in the contralesional hemisphere.

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NOTIZEN:

**07 Emotional modulation of picture-, face- and word-evoked ERPs following right temporal lobe resection – an ongoing study**

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Emotional modulation of the early posterior negativity (EPN) and late positive potential (LPP) in event related potentials reflect the ability of the human brain to respond rapidly to emotionally salient visual stimuli. This emotional modulation is commonly explained by amygdala-driven feedback in visual processing. The present study investigates the impact of absence of right medial temporal lobe structures including amygdala and hippocampus on emotional modulation of EPN and LPP elicited by negative pictures, faces and words. In our preliminary study, so far eight right Temporal Lobectomy (rTLE) patients (age M=41.38, SD=12.27; 5 females) and eight healthy controls (age M=36.75, SD=9.42; 4 females) passively viewed randomized blocks of negative and neutral scenes and words as well as of fearful and neutral faces while their EEG was recorded. In controls, emotion effects on EPN and LPP were significant for faces and pictures, and trend-level for words. For patients, EPN modulations were found for faces and in tendency for pictures, but not for words. Emotional modulation of LPP in patients was trend-level for all three categories. Between-Group-ANOVA reflected this difference in a significant three-way-interaction (type x valence x group) in LPP. Overall, absence of right medial temporal lobe structures reduces, but does not abolish emotional modulation of EPN and LPP, tentatively suggesting that these structures contribute to but are not exclusively responsible for emotional modulation of EPN and LPP. Furthermore, rTLE may affect later processing stages, reflected by the LPP, more than early processing stages.

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NOTIZEN:

**08 5-HTTLPR, TPH2-703 G/T und neuronale Korrelate von Emotionsregulation**

Pieritz, Karoline<sup>1,2</sup>; Neudert, Marie K.<sup>1,2</sup>; Zehner, Raphaela I.<sup>1,2</sup>; Tabbert, Katharina<sup>1,2</sup>; Schmitz, Anja<sup>3</sup>; Hennig, Jürgen<sup>2,3</sup>; Stark, Rudolf<sup>1,2</sup>; Hermann, Andrea<sup>1,2</sup>

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Das serotonerge System spielt eine wichtige Rolle bei der Verarbeitung und Regulation von Emotionen. Interindividuelle Unterschiede in der serotonergen Neurotransmission scheinen teilweise über genetische Polymorphismen vermittelt zu werden. Dazu zählt der Serotonintransporter-Gen-Polymorphismus 5-HTTLPR mit einer kurzen (S-Allel) und zwei langen (LG- bzw. LA-Allel) Varianten. Die S- und LG-Allele (S+) wurden mit reduzierter serotonerger Neurotransmission, negativer Affektivität und gesteigerter neuronaler Reaktivität auf emotionale Reize assoziiert. Ebenfalls bedeutsam ist der Polymorphismus des Tryptophan-Hydroxylase-2-Gens, mit einer T- und G-Variante (TPH2-703 G/T). Das T-Allel (T+) wurde ebenfalls mit einer reduzierten serotonergen Neurotransmission, erhöhter Vulnerabilität für psychische Störungen mit emotionaler Dysregulation sowie gesteigerter neuronaler Reaktivität auf emotionale Reize assoziiert. Ziel der vorliegenden Studie war es daher, den gemeinsamen Einfluss von 5-HTTLPR und TPH2-703 G/T auf neuronale Korrelate kognitiver Emotionsregulation zu untersuchen.

Für die funktionelle Magnetresonanztomographie-Studie wurden 75 Personen entsprechend ihres 5-HTTLPR (S+ vs. S-) und TPH2-703 G/T (T+ vs. T-) Genotyps eingeladen und anhand der Anzahl ihrer Risikoallele in drei Gruppen eingeteilt (T+S+ vs. T+S-/T-S+ vs. T-S-). Den Teilnehmern wurde neutrales sowie aversives (ekelinduzierendes) Bildmaterial präsentiert, wobei sie instruiert wurden, dieses entweder passiv zu betrachten oder ihre Emotionen mittels kognitiver Neubewertung zu verringern.

Ergebnisse legen nahe, dass Träger von Risikoallelen beim Betrachten aversiver Stimuli mehr neuronale Aktivierung im N. caudatus zeigen, was für eine gesteigerte emotionale Reaktivität sprechen könnte. Bei ihnen zeigte sich während der Emotionsregulationsaufgabe außerdem eine reduzierte Aktivität im dorsalen anterioren cingulären Cortex und ventrolateralen präfrontalen Cortex, was einen erhöhten Regulationsaufwand bedeuten könnte. Insgesamt weisen die Ergebnisse auf kombinierte Effekte beider Polymorphismen hin.

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NOTIZEN:



**09 Effekte von Stress auf die Erkennung und neuronale Verarbeitung von emotionalen Gesichtsausdrücken**

Brustkern, Johanna<sup>1</sup>; von Dawans, Bernadette<sup>1,2</sup>; Domes, Gregor<sup>1,2</sup>; Heinrichs, Markus<sup>1</sup>; Schiller, Bastian<sup>1</sup>

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Als adaptive Reaktionen auf psychosozialen Stress werden in der Literatur sowohl vermehrtes Flucht- und Kampfverhalten („fight-or-flight“) wie auch vermehrtes Aufsuchen positiver und unterstützender sozialer Kontakte („tend-and-befriend“) diskutiert. In der vorliegenden Studie sollen diese beiden Hypothesen hinsichtlich der Effekte von Stress auf die Erkennung von fröhlichen und ärgerlichen Gesichtsausdrücken und die zugrundeliegende neuronale Verarbeitung untersucht werden. Bei 61 männlichen Teilnehmern wurde die Gehirnaktivität mittels Elektroenzephalografie registriert, während diese an einem für die EEG-Umgebung adaptierten Trier Social Stress-Test teilnahmen (TSST; Stressbedingung: N=30; Kontrollbedingung: N=31). Unmittelbar nach der psychosozialen Stressinduktion absolvierten die Teilnehmer eine Emotionserkennungsaufgabe, in welcher sie fröhliche und ärgerliche Gesichter schwacher und starker Intensität von neutralen Gesichtern unterscheiden sollten. Nach Durchführung des TSSTs fanden sich in der Stressbedingung im Vergleich zur Kontrollbedingung signifikant erhöhte subjektive und physiologische Stressparameter. Unter Stress erkannten die Teilnehmer leicht fröhliche Gesichtsausdrücke signifikant schlechter als in der Kontrollbedingung. Für fröhliche Gesichter starker Intensität und ärgerliche Gesichter gab es keine Unterschiede. Mithilfe einer räumlich-zeitlichen EKP-Mikrozustandsanalyse wurden sieben während der Emotionserkennung ablaufende kognitive Prozesse identifiziert. In explorativen Analysen zeigte sich für leicht fröhliche Gesichter eine geringere Intensität der neuronalen Verarbeitung (mittlere Global Field Power) in der Stressbedingung bei einem früh auftretenden Prozess (N170), welcher mit der Verarbeitung von Gesichtern assoziiert wird. Stress scheint also die Verarbeitung von fröhlichen Gesichtern schwacher Intensität zu erschweren. Dies könnte dadurch erklärt werden, dass unter Stress das Erkennen von positiven Gesichtsausdrücken eine geringere Relevanz aufweist, was wiederum gegen das Vorliegen einer globalen Verhaltenstendenz zum Aufsuchen positiver soziale Kontakte („tend-and-befriend“) bei Männern unter Stress spricht.

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NOTIZEN:

**10 Inter-individual differences in neural correlates of emotion regulation**

Scheffel, Christoph; Dörfel, Denise; Schönfeld, Sabine; Diers, Kersten; Brocke, Burkhard; Strobel, Alexander

Technische Universität Dresden, Deutschland

Emotion regulation is necessary, when type, intensity, or duration of an emotion is not adequate for a specific situation. A common used emotion regulation strategy is detachment. During emotion regulation, activity in brain regions associated with cognitive control intensifies, and activity in brain regions associated with emotion responding diminishes. Immediately after regulation, activity in the amygdala increases and forms a paradoxical aftereffect. Extensive literature exists describing these immediate and short-term neural effects, but only few studies targeted the association between individual differences in personality traits and neural correlates of emotion regulation. N = 85 healthy participants completed the German version of the NEO Five Factor Inventory and the PANAS scale to measure personality traits and positive and negative affect. An emotion regulation task with relaxation period was conducted within the fMRI scanner. Participants should permit or detach their emotions during inspection of negative and neutral images. During emotion regulation, we found activation in the prefrontal cortex and deactivation in the left amygdala. During the post-regulation period, an immediate paradoxical aftereffect was found in occipital regions and marginally in the amygdala. Personality traits did not predict arousal ratings and neural activity in the amygdala during emotion regulation or post-regulation. To conclude, we replicated typical activation and deactivation patterns during intentional emotion regulation. Depending on the statistical approach, we partially replicated the paradoxical aftereffect in the amygdala. However, there was no association between personality traits and activation in the amygdala.

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NOTIZEN:

**11 Novelty facilitated extinction reduces the reinstatement of conditional human fear**

Lipp, Ottmar; Lucas, Katherine; Luck, Camilla

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Although contemporary treatments for anxiety disorders are very efficient in reducing anxiety, return of fear after successful treatment is common which signifies a need for interventions that have a more enduring outcome. A recent laboratory study suggested that novelty-facilitated extinction, a simple modification to standard extinction which involves presenting a novel non-aversive stimulus during extinction, prevents spontaneous recovery, one laboratory analogue of return of fear. The current study assessed whether novelty-facilitated extinction can also prevent reinstatement, a second laboratory analogue of return of fear. Following differential fear conditioning, one group of participants underwent standard extinction training whereas the second was presented with a novel tone after the conditional stimulus that previously predicted the aversive unconditional stimulus (US). Three presentations of the US alone reinstated differential electrodermal fear responses after standard extinction, but not after novelty-facilitated extinction. Moreover, replicating previous findings, the extent of return of fear was correlated with self-reported intolerance of uncertainty after standard extinction, but not after novelty-facilitated extinction. These results support the proposal that manipulations that strengthen extinction learning can reduce the extent of return of fear.

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NOTIZEN:

**12 Time course of emotional vocalization processing in congenitally blind humans**

Garrido-Vásquez, Patricia

Justus-Liebig-Universität Giessen, Deutschland

Congenitally blind (i.e. blind from birth) humans show superior auditory functions compared to sighted people. They also exhibit enhanced amygdala activation to auditory emotional stimuli, as shown in a previous fMRI study. Since the amygdala is involved both in early bottom-up modulation of cortical responses to emotional stimuli and in later top-down processes, this enhanced amygdala response in the blind could be early, late, or both. To investigate at which point in time congenitally blind humans differ from sighted individuals in auditory emotion processing, we used the millisecond resolution of event-related potentials. We measured the electroencephalogram while congenitally blind humans and sighted control participants were listening to emotional vocalizations in angry, fearful, happy, or neutral intonation and engaged in an implicit (gender decision) or explicit task (emotion categorization). Preliminary data analysis shows that early auditory event-related potentials (N100 and P200) did not differ between the two groups. However, congenitally blind people showed superior discrimination of the emotion categories at a later point in time, starting at around 700 milliseconds after stimulus onset. These data suggest that the initial detection of emotional relevance in auditory vocalizations is comparable in blind and sighted individuals, but that later in-depth processing of these stimuli is more pronounced in the blind.

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NOTIZEN:

**13** The highs and the lows: 5-HTTLPR moderates daily affect

Sicorello, Maurizio<sup>1,2</sup>; Dieckmann, Linda<sup>1</sup>; Schlotz, Wolff<sup>3</sup>; Neubauer, Andreas B.<sup>4</sup>; Kumsta, Robert<sup>1</sup>

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The 5-HTTLPR is one of the most frequently researched candidate genes in clinical psychology. Still, in recent years, different meta-analyses have been alternating between either confirming or refuting its infamous moderating effect on the stress–depression relationship. Some authors have proposed that instead of making individuals more vulnerable to negative events, the 5-HTTLPR S-allele might actually predispose people to be more susceptible to both negative and positive events. We tested whether the 5-HTTLPR is a differential susceptibility factor, influencing situation-congruent mood reactivity.

We assessed daily stressors and uplifts as well as momentary negative and positive affect in a sample of  $N = 326$  participants in everyday life. In the main analysis, we combined stressors and uplifts in a unidimensional environment variable and positive and negative affect in a unidimensional outcome variable to conduct a formal statistical test of differential susceptibility.

The main analysis revealed that the L/L-genotype—not the classic S-risk-allele—meets the formal criteria of a differential susceptibility factor. For this group, the relationship between environmental influences and affect was significantly stronger than for other genotypes. In contrast, separate analyses on the uncombined scales showed that this effect was largely driven by the positive affect of L/L-carriers being significantly more reactive to positive events.

Our study represents the first formal test of differential susceptibility in everyday life. Our findings emphasize the importance of the 5-HTTLPR in affective flexibility and demonstrate that its role might be more nuanced than the past notion of the S-allele simply making bad circumstances worse.

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NOTIZEN:

**14 Kardiale Modulation der Schreckreaktion bei hoher gegenüber niedriger Symptombelastung: afferente Signalübermittlung auf der Hirn-Körper-Achse beeinflusst frühe Stimulus-Verarbeitung bei hoher Symptombelastung**

Dierolf, Angelika<sup>1</sup>; Rost, Silke<sup>1</sup>; Lutz, Annika<sup>1</sup>; Flasiński, Tabea<sup>1</sup>; Münch, Eva Elisabeth<sup>1</sup>; Vögele, Claus<sup>1</sup>; Witthöft, Michael<sup>2</sup>; Schulz, André<sup>1</sup>

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Somatische Belastungsstörungen (SBS) sind oftmals durch andauernde medizinisch-unerklärte Symptome gekennzeichnet, deren Entstehung größtenteils ungeklärt ist. Diese Studie hatte zum Ziel, die empirisch bislang unbeantwortete Frage zu klären, ob Symptomentstehung auf veränderte Signalübermittlung auf der Hirn-Körper-Achse zurückzuführen ist. Zunächst wurden 486 Personen aus der Allgemeinbevölkerung anhand des SOMS-2 in Personen mit hoher Symptombelastung (HSB; unterstes Perzentil) und niedriger Symptombelastung (NSB; oberstes Perzentil) unterteilt. Personen mit HSB stellen eine besondere Risikogruppe für SBS dar. 28 HSB- und 31 NSB-Personen durchliefen ein Paradigma der kardialen Modulation der Schreckreaktion (CMS), ein Verfahren, das kardio-afferente Signalübermittlung prä-attentiv abbilden kann. Ihnen wurden je zehn akustische Schreckreize (105 dB) in sechs Zeitpunkten nach der kardialen R-Zacke (0, 100, 200, 300, 400, 500 ms) präsentiert. Als Indikator für die Schreckreaktion wurden die N1- und P2-Amplitude der auditorisch-evozierten Potenziale über Cz gemessen, da der Effekt der Hirn-Körper-Signalübermittlung im Kortex abgebildet werden sollte. Es zeigten sich geringere N1-Amplituden auf die Schreckreize, die während der systolischen Phase (200, 300 ms) im Vergleich zur diastolischen Phase (0 ms) präsentiert wurden ( $p=.0002$ ), was für das Vorliegen eines CMS-Effekts spricht. Die HSB-Gruppe zeigte höhere P2-Amplituden als die NSB-Gruppe. Es zeigte sich außerdem, dass der CMS-Effekt bezüglich der N1-Komponente in der HSB-Gruppe geringer ist ( $p=.035$ ), jedoch bezüglich der P2-Komponente stärker ist als in der NSB-Gruppe ( $p=.031$ ). Afferente Signalübermittlung auf der Hirn-Körper-Achse könnte bei Personen mit HSB bereits frühe, automatische Wahrnehmungsprozesse verändern, die durch späte, aufmerksamkeits-gesteuerte Prozesse kompensiert werden. Diese prä-attentive Beeinflussung der Stimulus-Verarbeitung könnte ein Mechanismus der Symptomentstehung bei Personen mit HSB und SBS sein.

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NOTIZEN:

**15 De-generalization of conditioned fear: Feedback increases beneficial effects of a discrimination training**

Herzog, Katharina<sup>1</sup>; Andreatta, Marta<sup>1</sup>; Domschke, Katharina<sup>2</sup>; Pauli, Paul<sup>1,3</sup>

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Anxiety patients tend to generalize conditioned fear, possibly because of an incapacity to perceive differences between stimuli. We examined the reversibility of fear generalization by a discrimination training. As feedback has been shown to improve discrimination learning we compared trainings with and without feedback. All participants underwent a differential conditioning during which one face stimulus (CS+), but not another face stimulus (CS-), became associated with an aversive scream (US). During generalization, CS+ and CS- as well as four morphs (GS1-4) were presented. Then, two groups underwent a de-generalization training teaching to discriminate the CS+ from the other faces. Importantly, one group received feedback on their performance (N = 20), but not the other group (N = 16). Two additional groups, one with feedback (N = 19), one without (N = 20), underwent a control discrimination task. Successful acquisition of fear was indicated by discriminative ratings (valence, arousal, contingency) between CS+ and CS-, as well as increased skin conductance response (SCR) to CS+ as compared with CS-. To quantify fear generalization the Linear Deviation Score (LDS) was calculated for each rating and SCR. LDSs of the groups did not differ before training. After training the LDSs revealed better face discrimination (i.e. less generalization) in contingency and arousal ratings, especially for those who received feedback. In conclusion, a de-generalization task with feedback facilitates stimulus discrimination, i.e. reduces generalization of fear.

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NOTIZEN:



**16 Appetitive Konditionierung in komplexen Szenen**

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Dysfunktionale appetitive Konditionierungsprozesse gelten als zentrales Modell für Entstehung und Aufrechterhaltung psychischer Störungen wie Suchterkrankungen oder Depressionen. Einen wichtigen Faktor beim Konditionierungsprozess stellt Kontingenzbewusstheit dar. Diese beschreibt die explizite Kenntnis über die Reizrelationen zwischen konditionierten Stimuli (CS) und unkonditionierten Stimuli (UCS). Ob konditionierte Reaktionen (CR) appetitiver Konditionierung auch ohne Kontingenzbewusstheit auftreten können, wurde bisher für Blickbewegungen nicht untersucht. Komplexe Szenen ermöglichen hierbei die ökologisch validere Untersuchung von Blickbewegungsmaßen während des Akquisitionstrainings. In dieser Studie wurden als komplexe Szenen neutrale Bilder einer Küche präsentiert, innerhalb derer ein Küchenobjekt als CS+, dasselbe Objekt in anderer Farbe als CS- und weitere variierende Objekte als Distraktoren fungieren. Szenen, in denen der CS+ auftrat, wurden mit einem Geldgewinn von 50 Cent (UCS) gepaart. Die UCS-Erwartung wurde online für jeden Trial und neben Blickbewegungsmaßen auch Hautleitfähigkeit und subjektive Ratings erfasst. Es soll der Einfluss appetitiver Konditionierung auf Blickbewegungen in komplexen Szenen untersucht werden sowie, inwieweit durch online UCS-Erwartungsratings erfasste Kontingenzbewusstheit Blickbewegungen und Hautleitfähigkeit beeinflusst

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NOTIZEN:

**17** Temporal uncertainty of anxiety-inducing stimuli mediates brain activation

Böhme, Stephanie<sup>1</sup>; Becker, Michael<sup>2</sup>; Zeller, Julia BM<sup>3</sup>; Straube, Thomas<sup>2</sup>; Herrmann, Martin<sup>3</sup>

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Previous studies showed that anticipatory anxiety is associated with differential activation in a widespread network of brain areas. This network encompasses brain regions related to more basal physiological alterations to aspects of threat (e.g. amygdala, thalamus) as well as brain regions associated with high-level information processing (e.g. prefrontal cortex, insula). Typically, the latter brain regions and the bed nucleus of the stria terminalis (BNST) are activated in sustained anxiety whereas amygdala activation is especially pronounced in transient, phasic fear. Furthermore, uncertainty about (amongst others) the timing of potential threat is widely discussed to mediate processes take place before, during and after anxiety-provoking events. In the present study, we investigated differential neural activation to temporal predictable or unpredictable threatening and neutral stimuli in 109 healthy subjects while magnetic resonance imaging. Activation differences in amygdala, insula, BNST, and prefrontal cortex are in accordance with previous findings concerning the neural response to transient and sustained anxiety. Furthermore, temporal predictability of aversive stimuli mediated activation in the insula, BNST and prefrontal brain areas. Results were discussed concerning maladaptive responses to uncertainty of threat and their possible implications in developing and maintaining anxiety disorders.

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NOTIZEN:

**18 The Structural and Functional Signature of Action Control**

Schlüter, Caroline; Fraenz, Christoph; Pinnow, Marlies; Friedrich, Patrick; Güntürkün, Onur; Genç, Erhan

Ruhr-Universität Bochum, Deutschland

Individuals differ in their ability to initiate self- and emotional-control mechanisms. These differences have been explicitly described in Kuhl's action control theory (1992). Although interindividual differences in action control make a major contribution to our everyday life, their neural foundation remains unknown. Here we measured action control in a sample of 264 healthy adults and related interindividual differences in action control to variations in brain structure and resting-state connectivity. Our results demonstrate a significant negative correlation between decision-related action orientation (AOD) and amygdala volume. Further, we could show that the functional resting-state connectivity between the amygdala and the dorsal anterior cingulate cortex was significantly associated with AOD. Here stronger functional connectivity was associated with higher AOD-scores. These findings are the first to show that interindividual differences in action control, namely AOD, are based on the anatomical architecture and functional network of the amygdala.

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NOTIZEN:

**19 Düfte sind empfänglicher für evaluatives Konditionieren als Töne**

Pützer, Anika; Otto, Tobias; Wolf, Oliver T.

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Unsere Präferenzen für sensorische Stimuli sind von vorheriger Lernerfahrung abhängig. Diesbezüglich beschreibt der Prozess des evaluativen Konditionierens den Transfer affektiver Eigenschaften eines emotionalen Stimulus auf einen zuvor neutralen Stimulus, nachdem diese gemeinsam präsentiert wurden. Aufgrund einer engen Verknüpfung emotionaler und olfaktorischer Prozesse auf neuroanatomischer- und Verhaltensebene ist anzunehmen, dass olfaktorische Stimuli besonders leicht mit affektiven Eigenschaften assoziiert werden. In der vorliegenden Studie wurde daher überprüft, ob olfaktorische im Vergleich zu auditiven Stimuli besonders empfänglich für evaluatives Konditionieren sind.

Hierzu wählten wir zunächst in einer Pilotierung Düfte und Töne aus, die als unbekannt und neutral bewertet worden und gut voneinander zu unterscheiden waren. In der darauffolgenden Studie bewerteten 48 gesunde männliche (n=24) und weibliche VersuchsteilnehmerInnen diese Stimuli am ersten Untersuchungstag hinsichtlich ihrer affektiven Eigenschaften auf den Dimensionen Valenz, Arousal und Dominanz. Anschließend wurden jeweils ein Duft und ein Ton zusammen mit neutralen und ein anderer Duft und Ton mit aversiven Bildern dargeboten. Dies wurde 48 Stunden später wiederholt, gefolgt von einer weiteren emotionalen Bewertung der Stimuli.

Unsere Ergebnisse zeigen eine stärkere Abnahme der wahrgenommenen Valenz sowie eine stärkere Zunahme von Arousal und Dominanz für Düfte, die mit aversiven Bildern gepaart worden waren. Die Bewertungen der Töne waren unabhängig von der Emotionalität der Bilder.

Diese Befunde verdeutlichen, dass olfaktorische Stimuli für evaluatives Konditionieren empfänglicher sind, als auditive Stimuli. Eine mögliche Erklärung stellen Unterschiede in der Neuroanatomie des olfaktorischen und auditiven Systems dar, die sich dadurch auszeichnen, dass olfaktorische Information emotionsverarbeitende Hirnregionen während einer früheren kortikalen Verarbeitungsstufe erreicht, als auditive Information.

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NOTIZEN:

**20 Der Ton ist da, aber gleichzeitig nicht da: Neuronale Korrelate von hypnotischer Taubheit**

Schmidt, Barbara<sup>1</sup>; Naumann, Ewald<sup>2</sup>; Miltner, Wolfgang H.R.<sup>1</sup>

<sup>1</sup>Universität Jena, Deutschland; <sup>2</sup>Universität Trier, Deutschland

In vergangenen Studien zeigten wir, dass die Wahrnehmung von visuellen Reizen und Schmerzreizen durch hypnotische Suggestionen blockiert werden kann. Mit der verminderten Wahrnehmung dieser Reize ging eine Reduktion der Amplituden in ERP-Komponenten einher, die mit höheren Verarbeitungsprozessen assoziiert sind, wie die P3b. In der aktuellen Studie zeigen wir, dass auch die Wahrnehmung von akustischen Reizen durch die Suggestion von Kopfhörern unter Hypnose blockiert werden kann. Dazu untersuchten wir zwei Gruppen, 24 hoch und 24 niedrig suggestible Probanden. Wir verwendeten eine akustische Oddball Aufgabe, wobei die Probanden auf einen bestimmten seltenen Ton mit einem Tastendruck reagieren sollten. Außerdem präsentierten wir 40 Hz steady state Töne, die die Probanden nur anhören sollten. Die Probanden bewerteten alle präsentierten Töne unter der hypnotischen Suggestion von blockierenden Kopfhörern als leiser im Vergleich zu einer Kontrollbedingung. Die P3b Amplitude auf den zu beachtenden Ton in der Oddball Aufgabe war zudem drastisch reduziert in der Hypnose Bedingung im Vergleich zu einer Kontrollbedingung. Die steady state Reaktion auf die 40 Hz Töne war jedoch während der Hypnose Bedingung erhöht im Vergleich zu einer Kontrollbedingung. Aus diesen Ergebnissen folgern wir, dass die unmittelbare akustische Verarbeitung, die sich in der steady state Reaktion zeigt, unter Hypnose nicht reduziert ist, während die akustische Weiterverarbeitung, die sich in der P3b Amplitude auf den zu beachtenden Ton in der Oddball Aufgabe zeigt, reduziert ist. Dies entspricht unserem Modell einer neuronalen Dissoziation unter Hypnose, da die Töne zwar noch unmittelbare neuronale Reaktionen auslösen, aber die Weiterverarbeitung der Töne drastisch reduziert ist.

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NOTIZEN:

**21 Using phase-phase coupling measures from the fronto-parietal network to characterize the hypnotic state**

Naumann, Ewald<sup>1</sup>; Meier, Jacqueline<sup>1</sup>; Schmidt, Barbara<sup>2</sup>; Hecht, Holger<sup>2</sup>; Miltner, Wolfgang H.R.<sup>2</sup>

<sup>1</sup>Universität Trier, Deutschland; <sup>2</sup>Universität Jena, Deutschland

So far, no objective and unique behavioral or physiological indicators exist for the hypnotic state. It is expected that a hypnotic state leads to electrophysiological changes in the fronto parietal network, which is crucial for the normal conscious state.

Phase-coupling measures during the hypnotic state and different control conditions were compared in two independent studies in Trier (n=24) and Jena (n=48). Both studies used nearly identical hypnotic inductions. The hypnotic state was compared to a resting period. Additionally, study 2 allows a comparison of the hypnotic state to the rest, attention distraction, and fake hypnosis condition. Phase coupling measures were computed for theta, alpha, beta, and the gamma band from pooled electrodes over left and right frontal and parietal cortex. In both studies, theta and alpha phase-couplings were decreased during hypnosis compared to rest but not those of beta and gamma. Similar results were obtained with study 2 for the control and distraction condition. However, when subjects faked the hypnotic state, they showed similar changes as during the neutral trance in the theta and alpha bands.

These are first promising results to uniquely characterize the hypnotic state by oscillatory measures. Adding measures for couplings between bands and phase-amplitude couplings within and between bands might lead to a unique electrophysiological characterization of the hypnotic state.

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NOTIZEN:

**22 Phase Coherence of electrical activities within the fronto-parietal network and ERP amplitudes during hypnosis-induced blockage of vision, pain, and auditory processing**

Miltner, Wolfgang H.R.<sup>1</sup>; Schmidt, Barbara<sup>1</sup>; Franz, Marcel<sup>1</sup>; Naumann, Ewald<sup>2</sup>

<sup>1</sup>Friedrich-Schiller-Universität Jena, Deutschland; <sup>2</sup>Universität Trier, Deutschland

In three experiments, we investigated subjects' ratings and the pairwise phase consistencies (PPC) of brain EEG activities between frontal and parietal brain areas while high and low suggestible subjects underwent a hypnotic trance with suggestions to block the perception of visual/auditory and somatosensory stimuli. These conditions were compared to a distraction, a rest, and/or a simulation of hypnotic trance condition. For visual and auditory stimulation, a three-stimulus Oddball paradigm was used while in the somatosensory experiment painful and non-painful stimuli were presented. In the visual/auditory experiment, subjects counted the rare stimuli, while in the somatosensory experiment subjects rated the intensity of stimuli.

While subjects underwent the hypnosis condition, data analyses revealed a significant increase of counting errors and a reduction of P300 amplitudes to the visual and auditory stimuli and a significant intensity reduction of somatosensory stimuli and significantly reduced SEP N150-P260 amplitudes. All these effects were more expressed in high than in low suggestible subjects. None of these effects was observed in the distraction and rest conditions.

PPC of brain electrical activities within the theta and alpha frequency-range of the fronto-parietal network was significantly reduced during the hypnosis condition, indicating a breakdown of neural communication between frontal executive and stimulus-evaluative parietal areas.

Funded by Deutsche Forschungsgemeinschaft (DFG) (MI 265/15-1 und NA 482/5-1)

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NOTIZEN:

**23 Investigating Neuronal Correlates of Hypnosis that Improves Subsequent Sleep**

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Evidence that hypnosis can effectively improve objective sleep quality and alter coupling of oscillatory processes will be presented. Two recent studies demonstrate that a hypnosis induction and the suggestion to sleep deeper are effectively increasing slow wave sleep (SWS) as well as slow wave activity. Both are essential for somatic regeneration and brain plasticity. Here I present a third replication and generalization of these findings, extending the results from only females to both sexes and from daytime naps to a full night of sleep. In addition, I will present in-depth analyses of oscillatory processes affected by hypnosis across all three study samples. The neuronal dissociation hypothesis states, that hypnosis is an altered state of consciousness caused by a decoupling of brain areas, normally being coupled. A very consistent finding for high suggestible subjects is an increase of theta activity in hypnosis compared to control conditions. Gamma activity is also linked to hypnosis, but findings are much more inconsistent. A possible explanation is that not gamma activity per se, but its coupling to theta is associated with hypnosis. Our data shows theta-gamma phase-amplitude coupling to be generally present while subjects listen to the hypnosis or a control text. However, the strength of coupling is weaker during hypnosis compared to the control condition in high suggestible subjects, supporting the neuronal dissociation hypothesis. Based on our data, I propose that cross-frequency phase-amplitude coupling causally underlies the effects of hypnosis of subsequent sleep processes.

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NOTIZEN:



**24 The effect of handedness on perceived hand positions in the rubber hand illusion**

Bleich, Chiara<sup>1</sup>; Fuchs, Xaver<sup>2</sup>; Heinzen, Oliver<sup>1</sup>; Trojan, Jörg<sup>1</sup>

<sup>1</sup>Universität Koblenz-Landau; <sup>2</sup>Universität Bielefeld

The aim of this study was to examine differences between left- and right-handers in the rubber hand illusion (RHI). In 20 left-handed and 20 right-handed participants we measured ownership ratings and hand localisation via pointing movements. We examined whether they varied depending on handedness (left, right), hand (left, right), and stimulation condition (synchronous, asynchronous, no stimulation). Localisation was also measured in another two baseline conditions. Ownership ratings were highest in the synchronous condition and differed significantly from both the asynchronous and no stimulation conditions, but there were no significant main effects of handedness or hand. Localisations were significantly shifted towards the rubber hand, whenever it was present, but no significant differences between the three stimulation conditions were observed and neither were there any other significant main effects. We found marginally significant handedness  $\times$  hand and handedness  $\times$  condition interactions for ownership and location, respectively, whose potential meaning will be discussed. In conclusion, we found no substantial differences between left- and right-handers concerning effects of the RHI, neither in respect to subjective ratings nor concerning their pointing movements. However, some unexpected patterns in the data warrant further examination.

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NOTIZEN:

**25 Evoked phantom sensations in amputees: a link between neural processing of body illusions and altered body perception**

Milde, Christopher<sup>1,2</sup>; Diers, Martin<sup>1,3</sup>; Andoh, Jamila<sup>1</sup>; Becker, Susanne<sup>1</sup>; Fuchs, Xaver<sup>1,4</sup>; Trojan, Jörg<sup>2</sup>; Bekrater-Bodmann, Robin<sup>1</sup>; Flor, Herta<sup>1</sup>

<sup>1</sup>Department of Cognitive and Clinical Neuroscience, Central Institute of Mental Health, Medical Faculty Mannheim, Heidelberg University, Mannheim, Germany; <sup>2</sup>Department of Psychology, University of Koblenz-Landau, Landau, Germany; <sup>3</sup>Department Psychosomatic Medicine and Psychotherapy, Landschaftsverband Westfalen-Lippe - University Hospital, Ruhr-University, Bochum, Germany; <sup>4</sup>Faculty Psychology and Sports Science, University of Bielefeld, Germany

A disturbed body perception is characteristic for various neurological and mental disorders and becomes particularly evident in phantom phenomena after amputation. Most amputees continue to perceive the amputated limb and some perceive sensations in their missing limb, when body parts adjacent to or remote from the amputated limb are stimulated (i.e., evoked phantom sensations). We examined the neural networks of evoked phantom sensations and hypothesized that they can be linked to neural circuitry similar to those found in specific body illusions. Using functional magnetic resonance imaging, we investigated 12 amputees who reliably perceived non-painful evoked phantom sensations and 12 yoked controls. We elicit non-painful phantom sensations by tactile and electrical stimulation and also stimulated at control sites that did not elicit phantom sensations. In the controls, we stimulated at anatomically matched body sites.

Using a conjunction analysis we found increased brain activation in the ventral frontal (BA44/45) and premotor cortices as well as in the insula and putamen during elicitation of phantom sensations compared to both control conditions (within-amputees and yoked controls). A regressive generalized psychophysiological interaction analyses further revealed a widespread network showing significant positive intra-parietal and fronto-parietal connectivity. This network comprised the ventral frontal and premotor cortices that interacted with activation in the superior parietal lobe. The present findings associate non-painful phantom sensations with a fronto-parietal network similar to that reported in body illusions and altered body perception. These data emphasize the role of crossmodal stimulation in normalizing dysfunctional body representations.

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NOTIZEN:

**26 Transcranial Ultrasound (TUS): Exploring the Effects of TUS on Global Affect and Global Vigor in the Context of a Virtual T-Maze Task**

Forster, André<sup>1</sup>; Ziebell, Philipp<sup>1</sup>; Rodrigues, Johannes<sup>1</sup>; Allen, John<sup>2</sup>; Hewig, Johannes<sup>1</sup>

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Transcranial Ultrasound (TUS) is a non-invasive neuromodulation technique that has recently been applied to humans (Fini & Tyler, 2017). Compared to other techniques like tDCS or TMS, it offers several advances, e.g. a more focused application, and does not produce side effects such as headache (Tyler et al., 2008; Tyler, 2011). Previous studies that explored TUS-caused mood effects found significant increases in global affect after resting phases ranging from 5 – 40 minutes post-TUS application, targeting the right inferior prefrontal cortex through the right trans-temporal window (Hameroff et al., 2013; Reznik, Sanguinetti, & Allen, 2016; Sanguinetti et al., 2014; Sanguinetti, Hameroff, & Allen, 2017). The current study was designed to replicate these findings while adding a task, the virtual T-Maze introduced by Rodrigues, Müller, Mühlberger and Hewig (2017), as well as extending the time intervals between the mood measurements: pre-TUS, post-TUS after 60 min and again after 120 min.

Reported here are preliminary data of currently 18 subjects, each completing three different conditions on three different days: TUS, TUS-Sham, TUS-None. Mood was operationalized using the Visual Analogue Mood Scales (VAMS; Stern, Arruda, Hooper, Wolfner & Morey, 1997). No effects on global affect were found, but post-hoc tests revealed an effect on global vigor. Former studies used a VAMS version (Monk, 1989) that differed from that used in the current study, suggesting that TUS may impact more specific mood symptoms rather than global positive affect. These specific impacts of TUS are discussed and directions for future research are suggested.

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NOTIZEN:

**27 Cumulative Dopamine Genetic Score predicts behavioral and electrocortical correlates of response inhibition via interactions with task demand**

Enge, Sören<sup>1,2</sup>; Sach, Mareike<sup>1</sup>; Reif, Andreas<sup>3</sup>; Fleischhauer, Monika<sup>4</sup>

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Functional polymorphisms in the dopamine (DA) system have been implied to underlie individual differences in response inhibition. To address this topic on a system-level and to overcome some of the limitations of research on single polymorphisms, a cumulative genetic score (CGS) was used in the present study. Alleles previously associated with both impulsive behavior and a lower DA tone, namely the DRD4 Exon III 7R, DAT1 VNTR 10R and the COMT Val158Met val allele, added a point to the DA-CGS. Participants (N=130) completed conditions of a Go/No-Go task varying in difficulty, with the upper time limit for responding being 400ms or 500ms. EEG recordings were made with focus on the NoGo-P3, an ERP known to reflect inhibitory response processes. We found a higher DA-CGS to be associated with better performance in the more demanding condition, but relatively worse performance during the easier task condition, whereas the reverse was true for individuals with lower DA-CGS. Accordingly, the NoGo-P3 amplitude was larger in the more demanding condition than in the easier one for individuals with a higher DA-CGS and vice versa for those with a lower DA-CGS. In line with recent models of DA functioning we conclude that an optimum level of DA may exist for response inhibition and that higher task demands might have increased phasic DA and thus “pushed” DA levels towards this optimum for individuals with a lower DA tone (higher DA-CGS). At higher DA tone, however, this DA increase may have alleviated DA levels beyond the optimum.

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NOTIZEN:

**28** Age-related changes in the distinctiveness of memory representations

Sommer, Verena<sup>1</sup>; Werkle-Bergner, Markus<sup>1</sup>; Fandakova, Yana<sup>1</sup>; Grandy, Thomas<sup>1</sup>; Shing, Yee Lee<sup>1,2</sup>; Sander, Myriam<sup>1</sup>

<sup>1</sup>Max Planck Institute for Human Development, Berlin, Germany; <sup>2</sup>University of Stirling, Stirling, Scotland, UK

Although neurocognitive aging research has yielded important insights into age-related changes in memory abilities, little is known about changes of the quality of memory representations. We propose that investigating age differences on the level of neural representations and their relation to memory adds a novel perspective on age-related memory decline.

Recent studies focussing mostly on young adulthood showed that stability and distinctiveness/overlap of neural activation patterns are crucial for memory success. However, whereas stability of representations across item repetition has clearly shown to benefit memory, findings regarding pattern distinctiveness are highly inconsistent across the memory and aging literature, providing evidence of beneficial effects of either distinct or similar neural representations.

To further investigate the link between neural distinctiveness and memory success, we examined spatiotemporal frequency patterns during memory encoding in an age-comparative electroencephalography study. Twenty-nine young (YA; 19-25 y.) and 42 old (OA; 65-75 y.) adults studied 440 and 280 scene-word pairs, respectively. We compared pattern distinctiveness between subsequently remembered and forgotten items by applying representational similarity analysis. We identified age-related and performance-related differences in the distinctiveness of memory representations: Whereas YA benefited from high distinctiveness later during encoding, OA benefited from high representational overlap earlier during encoding.

Our preliminary findings underline the high relevance of investigating pattern distinctiveness/overlap in addition to stability as potential representational characteristic for successful memory formation and how it may change during aging. In addition, it indicates that the frequency of neural oscillations may play a particularly important role in representing memory-relevant information.

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NOTIZEN:

**29** Acute stress differentially affects the habitualization of approach and avoidance behavior in men and women

Zwosta, Katharina; Karcz, Tatjana; Ruge, Hannes; Walser, Moritz; Goschke, Thomas; Kirschbaum, Clemens; Wolfensteller, Uta

Technische Universität Dresden, Deutschland

Previous studies suggest that acute stress reduces flexible goal-directed action control in favor of habitual action control such that stressed participants show an increased tendency to execute previously rewarded behavior even after the outcome is devalued. On the other hand, there is evidence that acute stress differentially affects learning from reward and punishment. Hence, the present study aimed at investigating the effects of acute stress on the acquisition and habitualization of both rewarded approach behavior as well as punishment avoidance behavior. Of 64 participants, one half underwent the Trier Social Stress Test inducing acute psychosocial stress, while the other half was subjected to a corresponding control procedure. Consecutively, habitual approach and avoidance behavior was established by overtraining participants on responses leading to a monetary reward or avoiding a monetary loss. Finally, after subjects were informed that they could no longer gain or lose money, habit strength was tested by the amount of interference the overtrained response tendencies imposed on goal-directed behavior. While there were no main effects of acute stress on either learning rate or habit strength, we found significant interactions between gender and motivation type. Specifically, stressed men showed faster learning of approach behavior and stronger approach habits than non-stressed men, while stressed women displayed slower learning from reward and stronger avoidance habits compared to non-stressed women. These results suggest that the effects of acute stress on behavioral flexibility differ for approach and avoidance behavior depending on gender.

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NOTIZEN:

**30** Need for cognitive closure does not modulate the processing of ambiguous versus negative feedback in a time estimation task

Ulrich, Natalie; Osinsky, Roman

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Need for cognitive closure (NFCC) refers to an urge to quickly resolve open decision situations (in a broad sense). This urge is thought to be related to a negative evaluation of ambiguous situations. In the present study, we tested whether NFCC correlates with a negative evaluation of ambiguous feedback. Specifically, we hypothesized that high NFCC should be associated with evaluating ambiguous feedback as more negative than negative feedback. Our sample consisted of 68 university students who completed a time estimation task. On two thirds of the trials, participants received valid feedback, contingent on their performance. The remaining trials contained ambiguous feedback that did not provide information on the participants' performance. We analyzed the feedback-related negativity (FRN) elicited by positive, negative and ambiguous feedback and correlated the difference in FRN amplitude between negative and ambiguous feedback with NFCC. Our results show that overall, negative and ambiguous feedback elicit larger FRN amplitudes (i.e. a larger negativity) than positive feedback, with no significant difference between negative and ambiguous feedback. Contrary to our hypothesis, we found no correlation between NFCC and the FRN difference between negative and ambiguous feedback. Potential implications of this finding are discussed, touching on the relation between ambiguity aversion and NFCC, as well as special features of the paradigm used.

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NOTIZEN:

**31** Wanderlust – travelling and stationary sleep oscillations

Himmer, Lea; Schönauer, Monika; Bürger, Zoé; Maschke, Janina; Wagner, Lore; Braun, Christoph; Gais, Steffen

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Slow waves and sleep spindles represent exclusive hallmarks of the sleeping brain's activity. Various conflicting theories about their physiology and emergence across the cortex exist. Here, we aim to elucidate their patterns of distribution and their spatio-temporal propagation across the brain.

We acquired high-density 268-channel MEG with additional EEG polysomnography of 10 participants. Each participant spent four 6-h nights in the MEG, enabling us to compare nights within and across participants. Slow waves and sleep spindles were automatically detected and clustered into contiguous events across sensors using a nearest-neighbour algorithm.

The distribution of slow-wave events across the head showed a large diversity in their characteristics both in the temporal (stationary vs. travelling) and in the spatial domain (local vs. global). Travelling waves wandered for up to  $\sim 2$ s, covering distances of up to  $\sim 40$ cm. Slow waves originated uniformly from locations across the entire head surface and showed little preferred travel directions.

Sleep spindles also showed travelling properties, but to a lesser extent (up to  $\sim 1$ s and  $\sim 15$ cm). They had a more local appearance, but could occur in multiple synchronous but distinct bursts. Spindles often originated simultaneously in distant, analogous bilateral regions. Spindles were preferentially detected in clusters of central and occipital-parietal sensors.

The higher spatial resolution of MEG in combination with advanced clustering techniques revealed some unexpected characteristics of sleep oscillations, in particular their local origination and the spatial distinctness of simultaneous events. The distinct characteristics of slow waves and spindles imply divergent physiology and might also point to functional differences.

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NOTIZEN



**32** Different neural mechanisms for the processing of interruptions and distractions in a Continuous Number Task

Zickerick, Bianca; Thönes, Sven; Küper, Kristina; Kobald, S. Oliver; Wascher, Edmund

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Negative effects of interruptions and distractions on performance are well documented, particularly in tasks requiring working memory (WM). However, little is known about the neural mechanisms underlying these two types of external interference. In an EEG study, we examined the impact of interruptions and distractions on the performance of 16 younger adults in a continuous number task (CNT). In this task, a random sequence of single numbers (1 to 6) was presented. Participants had to either decide whether the current number (no WM load) or the sum of the current and the preceding number (WM load) was odd or even. Additionally, participants had to ignore single letters (distractions) or react to single letters (interruptions) that were randomly presented in 25% of all trials in different blocks.

As hypothesized, in the WM load condition, responses in trials that followed interruptions were significantly less accurate than those following distractions. In the EEG, these differences were reflected by a significantly lower fronto-central slow wave in trials after interruptions suggesting a disruptive effect of interruptions on WM maintenance. In trials following distractions a significantly larger P3 amplitude indicated increased availability of cognitive resources and attentional allocation to the relevant stimuli. Our results thus suggest different neural mechanisms for the processing of interruptions compared to distractions in tasks involving WM load.

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NOTIZEN

**33** Wirkprofil verschiedener Yoga-Atemtechniken

Epe, Janika; Ott, Ulrich; Stark, Rudolf

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Unterschiedliche Atemtechniken werden als Interventionen bei psychischen Störungen genutzt. So werden Patienten beispielsweise angeleitet, ihre Atemfrequenz zu beschleunigen, um körperliche Reaktionen hervorzurufen und zu erkennen, dass die Reaktionen beeinflussbar sind. Eine andere Möglichkeit ist, den Atem in einer vorgegebenen, langsamen Frequenz (meist ca. 10 Sekunden pro Atemzug) zu führen, was die Herzratenvariabilität (HRV) und die Baroreflex-Sensitivität steigern kann. Diese gelten als Indikatoren für eine intakte vegetative Regulation. In der vorliegenden Studie wurde das psychologische und (neuro-)physiologische Wirkprofil von vier verschiedenen Yoga-Atemtechniken evaluiert (ujjayi-Atmung, systematische Atemverlängerung, wechselseitige Nasenatmung, leichte Hyperventilation), um deren Wirksamkeit als Interventionen zur Steigerung der Fähigkeit zur Selbstregulation zu erfassen. Dazu wurde mit 36 gesunden Probanden ein achtwöchiges Training durchgeführt, in dem nacheinander vier Atemtechniken vermittelt wurden. Es sollte überprüft werden, ob sich das Befinden und Stresserleben der Probanden durch die Interventionen verändert, ob sich die kognitiven Funktionen (Aufmerksamkeit) verändern und ob Unterschiede in der Regulation verschiedener Netzwerke im Gehirn messbar werden (Default-mode Netzwerk (DMN), Salience-Netzwerk (SN,) Central Executive Netzwerk (CEN)). Die Messung verschiedener Parameter (EEG, EDA, EKG, Atemrhythmus) erfolgte an sechs bis acht Zeitpunkten, bis zu drei Mal vor Beginn des Trainings und jeweils nach dem Erlernen einer neuen Atemtechnik. Ein halbes Jahr nach der letzten Messung wurde eine Follow-Up Messung durchgeführt. Die Auswertung der (neuro-)physiologischen Daten steht noch aus. Erste Ergebnisse aus Fragebögen und Aufmerksamkeitstest weisen darauf hin, dass einzelne Atemtechniken spezifische Wirkprofile aufweisen.

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NOTIZEN

**34** The impact of early life adversity and glucose availability on the cortisol stress response

Meier, Maria; Bentele, Ulrike Ursula; Treitz, Fabian; Pruessner, Jens

Universität Konstanz, Deutschland

Early Life Adversity (ELA) and glucose availability have both been associated with regulatory alterations in the hypothalamic-pituitary-adrenal (HPA) axis mediated stress response. Both, individuals with a history of ELA and fasting individuals with low blood glucose levels exhibit a blunted cortisol response to acute psychosocial stress. However, the interaction of both factors has not been investigated yet.

Sixty-two healthy, fasted women (meanage = 22.63, sdage = 2.25) with high or low ELA – as indicated by a low ( $n = 17$ ) or high ( $n = 45$ ) maternal care score on the Parental Bonding Instrument – were exposed to the Trier Social Stress Test for Groups (TSST-G) after the consumption of either a glucose drink (64g glucose in 400ml of water,  $n = 33$ ) or water (400ml,  $n = 29$ ). Salivary cortisol and blood glucose concentrations were assessed repeatedly throughout the testing procedure.

Analyses showed a trend effect of low glucose levels and high ELA on blunted cortisol reactivity ( $F(1, 58) = 3.16, p = .081$ , and  $F(1, 58) = 3.71, p = .059$ , respectively). Notably, women with a history of ELA showed a robust cortisol response to the TSST-G after glucose administration. The interaction between both factors was however not significant. These results confirm the impact of both ELA exposure and glucose availability on HPA axis reactivity to stress. Future studies investigating more subjects and thus with greater statistical power will have to determine whether there is an interaction between the two.

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NOTIZEN

**35** Classical conditioning with imagined unconditioned stimuli

Mueller, Erik; Panitz, Christian; Sperl, Matthias

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In classical conditioning associations are formed by contingent presentations of conditioned stimuli and physical unconditioned stimuli. Studies on vicarious classical conditioning have shown that observing someone else receive a US, rather than experiencing the US oneself, may suffice to induce classical conditioning. Here, we go one step further and challenge the assumption that any perception of physical US delivery is necessary for classical conditioning. In two studies ( $N = 41$  and  $N = 45$ ), we show that the mere imagination of an aversive US – contingently and repeatedly triggered with CS presentation - successfully induces associative fear learning as measured with subjective ratings, fear bradycardia and fear potentiated startle. These findings may help to bring together cognitivist, social and behaviorist approaches to fear acquisition. They have important implications for the understanding and treatment of anxiety disorders, providing a new learning account for the development of anxiety in the absence of prior aversive experiences. Beyond anxiety, imaginative conditioning may be of relevance for the emergence and stability of addictive disorders, obsessive-compulsive disorder, pain disorders and even social stereotypes.

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NOTIZEN

**36** Response facilitation by task-irrelevant novel sounds is associated with increased pupil size

Schomaker, Judith; Wittmann, Bianca C.

Justus Liebig University Giessen, Deutschland

A novel stimulus can lead to distraction when drawing attention, or lead to facilitation when eliciting arousal. Previous studies have suggested that distraction occurs when the novel stimulus also conveys informational value, while task-irrelevant novels can result in short-lived facilitation. The facilitatory effects of novelty typically last a few hundred milliseconds and disappear at longer intervals. It is currently unclear what the neurobiological basis of novelty-induced facilitation is, but the timing of the effects is in line with the phasic locus coeruleus-norepinephrine (LC-NE) response. The LC-NE response has also been linked to pupil size. In the current study, we employed pupillometry to quantify arousal during a visual detection task. The visual target was either presented together with or preceded by a novel or standard sound. In one condition, the sounds were predictive of target onset, in the other, the target was presented at an uncertain interval. By creating conditions under which novelty typically leads to response facilitation (non-informative condition) and distraction (informative condition), we aimed to investigate the relationship between pupil size and novelty-induced response facilitation. In the non-informational condition, pupil size was larger for novels than standards at early but not late intervals, while no such effect was found in the informational condition. This effect was further elucidated by correlational analyses showing that a larger pupil size for novels in the non-informational condition was related to shorter response times at earlier SOAs. These results suggest that task-irrelevant novel stimuli elicit a LC-NE driven arousal response.

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NOTIZEN

**37** Decisions and Confidence in Ventromedial Prefrontal Cortex

Becker, Michael; Straube, Thomas

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When we can't rely on accumulated evidence to guide a confident decision we have to trust our gut feeling and guess. In the absence of a rule to be learned, trial-by-trial changes in pre-decisional and post-decisional confidence cannot refer to accumulated evidence. It is currently not known which regions track confidence estimates in the human brain when we can't rely on a metacognitive process (like registering the amount of evidence accumulated). We present fMRI data from a simple binary choice task that entailed confidence ratings and monetary feedback. Unbeknownst to subjects, the outcome could not be inferred from choice cues. Hence, neither pre-decision confidence nor post-decision confidence could be based on evidence accumulation. We show that a region in ventromedial prefrontal cortex (VMPFC) tracks trial-by-trial changes in reported confidence during the choice period. A network of attentional and valuation regions is associated with outcome processing during feedback presentation.

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NOTIZEN

**38 The Role of Pre-stimulus Alpha Power in Visual Discrimination and Selective Attention**Limbach, Katharina<sup>1,2</sup>; Corballis, Paul<sup>2</sup><sup>1</sup>Ruhr Universität Bochum, Deutschland; <sup>2</sup>The University of Auckland, New Zealand

The efficiency of visual information processing varies on a moment-to-moment basis. Near-threshold stimuli are sometimes detected easily, while at other times they may be missed altogether. Likewise, visual stimuli that appear at cued locations tend to be processed more efficiently than similar stimuli presented elsewhere. Recent research established a link between this variability in visual perception and fluctuations in EEG alpha power. Typically, low pre-stimulus alpha power is related to superior performance in visual detection and discrimination tasks, suggesting a link between variability in cortical excitability and visual processing. In addition, cues predicting the lateralization of a stimulus often result in reduced alpha power contralateral to the cued location, which implicates cortical excitability as a mechanism in directing spatial attention. Nevertheless, the precise relationship between alpha power and performance is currently debated, and it has not been established whether spontaneous and cue-related fluctuations in alpha power have similar behavioral consequences.

Here, we recorded EEG during a visual discrimination task in which 22 participants received either a spatial cue or a neutral (non-informative) cue prior to the presentation of a target stimulus at one of three locations. The paradigm successfully manipulated both behavior, i.e. faster and more accurate responses for spatial compared to neutral cues, and alpha power, showing lateralization for spatial cues. However, pre-stimulus alpha power had surprisingly little effect on behavioral performance under both conditions. These results especially challenge the role of alpha-power lateralization for attentional deployment as the lateralization was not beneficial for performance.

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NOTIZEN

**39** Resting frontal asymmetry and personality traits: A meta-analysis

Kuper, Niclas; Gärtner, Wiebke; Wacker, Jan

Universität Hamburg, Deutschland

Frontal EEG asymmetry has been widely used as a marker of emotion, motivation and psychopathology. Current models of frontal asymmetry conceptualize it as an index for motivational direction - either as a state or as a stable personality trait. The present meta-analysis seeks to provide a comprehensive quantitative review of the relationship between personality traits and frontal asymmetry measured in the resting state. We distinguished five personality clusters based on the reported data: extraversion, neuroticism, impulsivity, anger, and defensiveness. Data from 79 independent studies with overall almost 6000 participants was included in the meta-analysis. The results indicated very small yet significant effects for both extraversion and neuroticism in the expected direction. Less than 1% of the variance in extraversion and neuroticism could be explained by resting frontal asymmetry. Similarly, a small but slightly larger effect was observed for trait anger. No significant effect emerged for impulsivity. A small to medium sized effect was observed for defensiveness, with the smallest number of studies in this cluster. The effects were further reduced after adjustment for publication bias. Given substantial heterogeneity in several main analyses, moderator analyses including both methodological as well as conceptual predictors are presented. We conclude that the validity of resting frontal asymmetry as a marker for personality is not supported. This is discussed with respect to the current replication crisis in psychology. Future research should focus on state frontal asymmetry measured in situations relevant to particular personality traits consistent with a conceptualization of traits as dispositions.

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NOTIZEN



**40** Sensory gating for unimodal and bimodal stimuli during voluntary movement

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**Introduction:** Sensory inputs originating from a common source need to be integrated to create a single distinct perceptual experience. During active motion, the perceived magnitude of a touch on the moving limb is reduced – a phenomenon known as sensory gating. Here we investigated whether gating of a touch stimulus might be affected by the presence of a stimulus in another modality (auditory), designed to be perceived as part of single bimodal event.

**Methods:** We measured the perceived magnitude of a stimulus presented to the right index finger during a voluntary movement of the right arm using a two-interval forced choice in which participants reported which stimulus was most intense – a reference presented on a stationary finger or the test stimulus on the moving finger. The intensity of the stationary-finger stimulus was modified by an adaptive staircase. In the bimodal condition, they received an auditory beep coupled to the onset of the tactile test stimulus. The beep was of the same perceived magnitude as the touch, as assessed before the trial.

**Results:** Tactile stimuli were judged as of significantly higher magnitude during movement, confirming tactile gating. The addition of the sound increased the perceived magnitude of the tactile test stimulus with a trend towards gating also.

**Conclusions:** This suggests a general supramodal mechanism for processing action-bound stimuli, at least when they are subjectively matched for intensity.

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NOTIZEN

**41** **Fronto-parietal oscillations reflect distinct proactive and reactive cognitive control mechanisms in the human brain.**

García Alanis, José C.; Güth, Malte R.; Peper, Martin

Philipps-Universität Marburg, Deutschland

Proactive control refers to a set of executive functions that allow us to anticipate behavioural demands and recruit cognitive control prior to the onset of goal-relevant events. Conversely, reactive control refers to the mechanisms that help us resolve conflicts and interference when expectations are violated. Here, we examined how brain activity patterns relate to a dynamic implementation of proactive and reactive control in the context of a Continuous Performance Task (CPT) and how these predict behavioural adaption to changing environmental demands. For this purpose, event-related potentials (ERP) and time-frequency analysis of the scalp-recorded electroencephalogram were analysed. 30 participants performed a Dot-Pattern CPT, which required them to establish stable proactive control based on the predictive value of cues. Conversely, reactive control had to be implemented when behavioural predictions were violated. Results indicate that participants' exertion of proactive control increased with time on task. Moreover, a stronger reliance on proactive control was associated with increased behavioural interference and decreased performance when predictions were violated. Brain activity patterns during exertion of proactive and reactive control differed significantly as well as their modulation over time. Proactive control was primarily associated with early selection and maintenance related ERPs and time-frequency modulations. We discuss how the balance between proactive and reactive control modes might be optimised over time to drive behavioural adaption.

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NOTIZEN

**42 Induction of unilateral neglect-like behaviour in healthy subjects: Exploring ambulatory assessment techniques.**

Ronoh, Erick K.; García Alanis, José C.; Taentzer, Gabriele; Peper, Martin

Philipps-Universität Marburg, Deutschland

Patients suffering from unilateral neglect encounter several problems while performing daily life activities (e.g., navigating through the environment), which may be elicited by inattention to contralesional space or poor multi-modal sensory transformation. Here, we tested the applicability of new ambulatory assessment technology to detect experimentally induced neglect-like behaviours in the field. We implemented a self-developed mobile phone application to assess deviations from walking trajectories in 20 healthy participants. Orientation and deviation from directional movement were measured using the phone's 3-axis accelerometer and gyroscope sensors, which tracked rotational velocity and changes in orientation during movement. Results indicate that phasic and tonic neglect-like movement deviations could be induced by making participants wear prismatic goggles or by means of visual distraction. We discuss how smartphone applications can help assess neglect-like behaviours (e.g., deviation from walking trajectory) in a real-life environment. Further, we provide initial empirical evidence that could help optimise clinical assessment of neglect symptoms in patients' daily life. In addition, we discuss how the feedback mechanisms (i.e. verbal, tone or vibrational mode) could be implemented in the mobile application and be applied to alleviate and improve patients' awareness to the contralesional space.

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NOTIZEN

**43 A protective mechanism against illusory perceptions is amygdala-dependent**

Spengler, Franny B.<sup>1,2</sup>; Scheele, Dirk<sup>1</sup>; Kaiser, Sabrina<sup>1</sup>; Heinrichs, Markus<sup>2</sup>; Hurlemann, René<sup>1</sup>

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Most people have a clear sense of body ownership. However, in some clinical conditions, such as schizophrenia, this bodily self-perception is distorted. Similarly, perceptual body illusions – most famously the rubber hand illusion (RHI) – can be elicited experimentally in healthy individuals. We hypothesize that the amygdala, a core component of neural circuits of fear processing, is involved in protective mechanisms against disturbed body perceptions. To test this hypothesis, we started by investigating two monozygotic twins with focal bilateral amygdala damage due to Urbach-Wiethe disease. Relative to 20 healthy controls, the twins exhibited, on two occasions one year apart, augmented RHI responses in form of faster onset and increased vividness ratings. Following up on these findings, we conducted a volumetric brain morphometry study involving an independent sample of 57 healthy volunteers: our results revealed a positive correlation between amygdala volume and RHI onset, ie, the smaller the amygdala, the less time it took the RHI to emerge. This raised the question of whether a similar phenotype would result from experimental amygdala inhibition. To dampen amygdala reactivity, we intranasally administered the peptide hormone oxytocin to the same 57 individuals in a randomized trial before conducting the RHI. Compared to placebo, oxytocin treatment yielded enhanced RHI responses, again evident in accelerated onset and increased vividness ratings. Taken together, the present series of experiments provides converging evidence for the amygdala's unprecedented role in reducing susceptibility to the RHI, thus protecting the organism from the potentially fatal threats of a distorted bodily self.

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NOTIZEN

**44 Perceived causal effects of cognitive and emotional strain on executive and emotional functioning**

Peper, Martin

Philipps-Universität Marburg, Deutschland

Perceived cognitive task demands as well as experienced socioemotional strain may be viewed as antecedent conditions as part of implicit theories of causation that permit us to predict performance and achievement. To explore subjective inferences pertaining to interactions of executive and emotional reactions, a new questionnaire was construed that assessed the effects of perceived cognitive and emotional antecedents on subjective executive and emotional behavior in everyday life situations. This 'Executive Emotion Inventory' (EEI) provides separate indices for executive and emotional hypo- and hyperreactivity as well as for their interactions. First results in healthy adults indicate that experiences of increased executive strain subjectively caused both cognitive as well as emotional hyperreactivity symptoms. Elevated emotional strain that induced negative emotions gave rise to dysexecutive symptoms (i.e. low proactive control and executive downregulation). In antecedent emotional situations that were perceived positively, levels of perceived executive or emotional dysfunction were low (emotion was upregulated, with low activation of executive control). Focusing on interactions of executive brain function and emotion, it is analyzed how perceived emotions and the executive subfunctions of maintenance, control of action and decision-making, supervision and monitoring, and cognitive flexibility mutually modulate each other to adapt behavior to real life demands.

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NOTIZEN

**45 Cue-Reactivity und Craving bei Verhaltenssuchten: Eine Meta-Analyse**

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Ein wesentlicher Faktor in der Ätiologie von Suchterkrankungen sind Cravingreaktionen, welche das unwiderstehliche Verlangen nach dem Konsum beinhalten. Die Grundlage für Cravingreaktionen bilden lerntheoretische Modelle, bei denen die belohnenden Eigenschaften der Substanzwirkung mit Hinweisreizen assoziiert werden (Cue-Reactivity). Das Cue-Reactivity- und Cravingkonzept wurde in einer Vielzahl von Studien auf Verhaltenssuchte übertragen. Ziel der Meta-Analyse ist es, die aktuellen Befunde zu subjektiven, peripher-physiologischen und neuralen Korrelaten von Cue-Reactivity und Craving für verschiedene Verhaltenssuchte systematisch zu betrachten. Achtzehn Studien (29 Datensätze, 519 Probanden) wurden in die Meta-Analyse eingeschlossen. Innerhalb der Studien wurden Patienten mit Gambling-, Gaming- und Buying-Disorder mit einem Cue-Reactivity Paradigma untersucht. Im Fokus lag zum einen der Vergleich zwischen der Reaktion von Patienten auf suchtrelevante versus suchtirrelevante Hinweisreize, und zum anderen auf dem Vergleich der Reaktion auf suchtrelevante Hinweisreize zwischen Patienten versus gesunden Kontrollprobanden.

Insgesamt zeigten Patienten mit Verhaltenssucht eine stärkere Reaktion auf suchtrelevante Hinweisreize im Vergleich zu Kontrollprobanden. Dies konnte innerhalb der Meta-Analyse auf subjektiver, peripher-physiologischer sowie neuraler Ebene gezeigt werden. Patienten zeigten eine stärkere Aktivierung im Nucleus caudatus, Gyrus frontalis inferior und Gyrus praecentralis. Beim Vergleich zwischen Reaktionen auf suchtrelevante und suchtirrelevante Reizen bei den Patienten zeigten sich keine Effekte der Reiz-Reaktivität auf subjektiver Ebene, jedoch auf peripher-physiologischer und neuraler Ebene. Hier wurden stärkere Aktivierungen im Nucleus caudatus, Gyrus frontalis inferior, Gyrus angularis, inferioren Netzwerk und dem Precuneus gefunden. Die Ergebnisse der Meta-Analyse weisen darauf hin, dass Cue-Reactivity ein Mechanismus ist, der nicht nur bei substanzgebundenen Störungen, sondern auch bei Verhaltenssuchten relevant ist.

**46** Alkohol als soziales Schmiermittel(?) – Akute Alkoholeffekte auf die emotionale Mimik bei sozialen Trinkern: ein systematischer Review

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Hintergrund: Die Annahme emotionsregulierender Alkoholeffekte ist nicht nur in der Gesellschaft weit verbreitet, sondern wird auch durch bisherige experimentelle Forschung gestützt. Obwohl Alkohol über verschiedene Wege auf die emotionale Mimik wirken kann und diese Effekte gerade in der sozialen Interaktion von besonderer Relevanz sein können, wurden sie bislang nicht zusammenfassend untersucht. Unser Review systematisiert daher bisherige Befunde zu akuten Alkoholeffekten auf die emotionale Mimik bei sozialen Trinkern.

Methode: Die Literatursuche in wissenschaftliche Datenbanken (PubMed, Web of Science, PsycInfo) ergab insgesamt 13 Studien, die emotionale Mimik bei sozialen Trinkern nach akuter Alkoholgabe mittels standardisierter Methoden erfassen und ausreichende methodische Qualität aufweisen.

Ergebnisse: Über alle Studien hinweg zeigten sich Alkoholeffekte auf die emotionale Mimik bei sozialen Trinkern. Diese Effekte sind jedoch von der Valenz der gezeigten Emotion sowie vom sozialen Umfeld abhängig. Wurde Alkohol in einer Gruppe konsumiert, drückten soziale Trinker mehr positive und weniger negative Emotionen über die Mimik aus als Probanden, die nicht-alkoholische Getränke zu sich genommen haben, was die Annahme sozialförderlicher Alkoholeffekte unterstützt. In Trinkkontexten ohne direkte soziale Interaktionspartner wurden Alkoholeffekte auf die emotionale Mimik weniger deutlich und waren teilweise abhängig von Persönlichkeitsmerkmalen (z.B. Aggressionsbereitschaft). Allerdings ist die Vergleichbarkeit der Studien durch methodische Unterschiede, wie bei der Alkoholgabe, eingeschränkt.

Dieser systematische Review verdeutlicht vor allem die Relevanz sozialer Kontextfaktoren für akute Alkoholeffekte auf die emotionale Mimik bei sozialen Trinkern. Zukünftige Forschung sollte untersuchen, inwieweit Moderatorvariablen (z.B. Persönlichkeitsfaktoren, Alkoholerfahrungen) eine Rolle bei diesen Effekten spielen und ob sozialförderliche Alkoholeffekte in einem möglichen Zusammenhang mit der Entwicklung von problematischem Trinkverhalten stehen.

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NOTIZEN

**47** Sleep quality as differential marker for burnout and depression?

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Background: There is much debate whether burnout is a form of depression or a distinct entity. Sleep disturbances are one main symptom of depression. Furthermore, studies have shown that people with burnout also show a bad sleep quality. It has been suggested, that individuals with burnout are chronically stressed, what might cause sleep disturbances. However, there is no data examining whether sleep quality is different in burnout and depression. Method: In 4'668 participants, burnout and depression were measured with the Maslach Burnout Inventory (MBI-GS), and the Patient Health Questionnaire 9 (PHQ-9), respectively. Sleep quality was assessed by the Pittsburgh Sleep Quality Index (PSQI). According to the MBI and PHQ-9 we divided the participants in four groups: control group - without burnout and depression (n=3445), burnout group (n=353), depression group (n=426), comorbid group - with burnout and depression (n=444).

Results: Multiple regression analysis showed both, burnout ( $\beta_i=0.42$ ,  $p<0.001$ ) and depression ( $\beta_i=0.56$ ,  $p<0.001$ ) to be negatively associated with sleep quality. With regard to group differences, people with depression showed a lower sleep quality, than people with burnout ( $\beta_i=0.11$ ,  $p<0.001$ ). In addition, the group with comorbid depression and burnout showed the lowest sleep quality compared to the other groups (vs. depression [ $\beta_i=0.07$ ,  $p<0.001$ ]; vs. burnout [ $\beta_i=0.18$ ,  $p<0.001$ ]; vs. controls [ $\beta_i=0.32$ ,  $p<0.001$ ]).

Conclusion: The present study indicates differences between burnout and depression with regard to sleep quality suggesting higher burden to be associated to worse sleep quality. Further analyses are needed to investigate differences in sleep dimensions (e.g. daily tiredness) between burnout and depression.

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NOTIZEN



**48 Investigating attentional mechanisms during contextual anxiety and extinction learning using steady-state VEPs**Stegmann, Yannik<sup>1</sup>; Reicherts, Philipp<sup>1</sup>; Pauli, Paul<sup>1</sup>; Wieser, Matthias J.<sup>2</sup><sup>1</sup>University of Würzburg, Germany; <sup>2</sup>Erasmus University Rotterdam, Netherlands

Anxiety is characterized by anxious anticipation and heightened vigilance to diffuse and uncertain threat. However, if threat is not reliably indicated by a specific cue, the context in which threat was experienced previously becomes its best predictor leading to anxiety. Accordingly, a suitable means to induce anxiety experimentally is context conditioning: one context (CTX+) is repeatedly paired with an unpredictable aversive stimulus (US), in contrast to a second context (CTX-), which is never paired with an US. In the present EEG study, we investigated attentional mechanisms during anxiety acquisition and extinction learning in 38 participants who underwent a context conditioning protocol. For the first time, flickering video stimuli (30s clips depicting virtual office rooms representing CTX+/-) were used to measure steady-state visual evoked potentials (ssVEPs) as an index of attentional resource allocation. Analyses of the electrocortical responses suggest a successful induction of ssVEP by video presentation in flicker mode. Besides, we found clear indices of context conditioning and extinction learning on a subjective level, while cortical processing of the CTX+ was enhanced during the first second of video-onset only. At later time points of the video the ssVEP in response to the CTX- was amplified compared to the CXT+. The differences between CTX+ and CTX- diminished during extinction learning. Together, these results could indicate that sustained anxiety is characterized by a hypervigilance-avoidance pattern in early stages of electrocortical visual processing.

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NOTIZEN

**49 The DRD2 gene and Internet addiction revisited**

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The topic of Internet addiction is further gaining in importance since one of its specific forms - Internet Gaming Disorder (IGD) – will be included into the upcoming ICD-11. Dopamine is among the most often investigated neurotransmitters in the area of addiction. In the context of IGD Han et al. (2007) demonstrated that the A1-allele of the dopaminergic polymorphism DRD2/ANKK1 Taq1A (rs1800497) was more frequent in a group of male online video game players compared to control participants.

The aim of the present study was to replicate the results by Han et al. (2007) and investigate several polymorphisms on the DRD2 gene and their link to different facets of Internet addiction. The Generalized Problematic Internet Use Scale 2 (GPIUS-2; Caplan, 2010) was used to measure Internet addiction in a sample of  $n = 986$  participants.

With respect to the rs1800497 SNP, in our sample the A1A1 genotype was significantly associated with higher scores of the facet “cognitive preoccupation” of the GPIUS-2 questionnaire. Additionally, A1-allele carriers scored higher than non-carriers on the subscale “negative outcomes”. Finally, a haplotype analysis was conducted, relying on all analysed DRD2 SNPs to further investigate the association between Internet addiction and the DRD2 gene.

Next to the replication regarding rs1800497, also the findings considering the haplotype analysis are discussed.

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NOTIZEN

**50** **Neurale Korrelate des GLRB-Gens auf Furchtreaktivität bei Patienten mit Panikstörung und Agoraphobie**

Ridderbusch, Isabelle Caroline<sup>1</sup>; Jan, Richter<sup>2</sup>; Yunbo, Yang<sup>1</sup>; Michael, Höfler<sup>3</sup>; Heike, Weber<sup>4,5</sup>; Andreas, Reif<sup>5</sup>; Alfons, Hamm<sup>2</sup>; Christiane, Pané-Farré<sup>2</sup>; Alexander, Gerlach<sup>6</sup>; Andreas, Ströhle<sup>7</sup>; Bettina, Pfleiderer<sup>8</sup>; Volker, Arolt<sup>9</sup>; Hans-Ulrich, Wittchen<sup>3,10</sup>; Andrew, Gloster<sup>11</sup>; Thomas, Lang<sup>12,13</sup>; Sylvia, Helbig-Lang<sup>13</sup>; Lydia, Fehm<sup>14</sup>; Paul, Pauli<sup>15</sup>; Tilo, Kircher<sup>1</sup>; Ulrike, Lüken<sup>3,4,14</sup>; Benjamin, Straube<sup>1</sup>

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Das GLRB (Glycin-Receptor Untereinheit Beta) encodierende Gen ist ein potentielles Risikogen für Panikstörung und Agoraphobie (PD/AG) und ist bei Gesunden mit veränderter BOLD-Aktivierung im Inselcortex als intermediärer Phänotyp des Defensivsystems während Furchtkonditionierung assoziiert. In einer multizentrischen klinischen Studie wurde mithilfe eines Furchtkonditionierungs- und -extinktionsparadigmas im fMRT (n=49 PD/AG Patienten, n=38 gesunde Kontrollen) untersucht, inwiefern die GLRB-Allelvariation im Einzelnukleotid-Polymorphismus rs7688285 mit differentieller neuraler Aktivierung assoziiert war und auf welche Weise genotyp-assoziierte BOLD-Aktivierung mit der An- bzw. Abwesenheit akuter Psychopathologie in Form von PD/AG interagiert. Außerdem wurde in der Patientengruppe der Einfluss

des Genotyps auf den Erfolg expositionsbasierter Kognitiver Verhaltenstherapie (KVT) auf die Symptomreduktion (n=184 Patienten) und auf neuraler Ebene (n=39 Patienten) der Einfluss der KVT auf eine veränderte BOLD-Aktivierung untersucht.

Vor der Therapie zeigte sich ein genereller Effekt des Genotyps: die Risikoallelträger zeigten sowohl in der Patienten- als auch in der Kontrollgruppe eine stärkere BOLD-Aktivierung im linken Hippocampus, bilateralen Motorcortex (MC) und im Inselcortex. Darüber hinaus interagierten Genotyp und Diagnose, da Aktivierungsunterschiede zwischen Patienten- und gesunden Risikoallelträgern im rechten MC, anterioren cingulären Cortex (ACC) und dem linken Inselcortex festgestellt wurden. Differentielles Lernen von Bedrohungs- und Sicherheitssignalen war besonders in der frühen Lernphase mit der BOLD-Aktivierung im Hippocampus, MC und cingulären Cortex assoziiert. Die Aktivierung im rechten ACC und linken MC bei Patienten war behandlungssensitiv, wohingegen kein Einfluss des Genotyps auf die Symptomreduktion gefunden wurde. Folglich scheint die GLRB-Genvariation auf neurofunktionaler Ebene als komplexer Modulator in PD/AG zu agieren und an ihrer Entstehung beteiligt zu sein.

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NOTIZEN

**51 Pathologische Sorgen: Eine quantitative koordinatenbasierte fMRT-Metaanalyse**Weber-Goericke, Fanny<sup>1</sup>; Mühlhan, Markus<sup>2</sup><sup>1</sup>Technische Universität Dresden, Deutschland; <sup>2</sup>Medical School Hamburg, Deutschland

Hintergrund: Exzessive Sorgen stellen eine beeinträchtigende kognitive Aktivität dar und begleiten eine große Bandbreite mentaler Störungen. Untersuchungen der zugrundeliegenden neuralen Aktivität erbrachten allerdings bisher kein einheitliches Bild beteiligter Hirnregionen. Ziel der vorliegenden qualitativen koordinatenbasierten Metaanalyse war daher die Überprüfung potenzieller Konvergenzen der mit exzessiven Sorgen in Zusammenhang stehenden neuralen Aktivität. Methodik: Mittels der „Activation Likelihood Estimation“ wurden 16 Experimente untersucht die Unterschiede zwischen Individuen mit hohen im Vergleich zu normalen Sorgen berichten. Ergebnisse: Konvergenzen veränderter neuraler Aktivierung zeigten sich hauptsächlich in einem linkshemisphärischen Cluster der Teile der mittleren frontalen und inferioren Gyri und der anterioren Insula überdeckt. Eine behaviorale Charakterisierung des Clusters mittels der BrainMap Datenbank ergab eine Einbindung der Region in Sprachprozessierung und semantische Gedächtnisprozesse. Eine weitere Modellierung der metaanalytischen Konnektivität zeigte zudem Verbindungen zu Kernregionen des Salienz Netzwerks und Teilen des Default Mode Netzwerks. Limitationen: Limitierend ist anzumerken, dass die Analyse keine „Region-of-Interest“ Befunde und keine Nullbefunde berücksichtigen kann. Fazit: Die Ergebnisse zeigen, dass exzessive Sorgen mit einer veränderten Funktionalität von Hirnregionen in Verbindung stehen die auf eine Störung des inneren Sprechens hinweisen könnte. Die identifizierten Regionen sind zudem bekannte Knotenpunkte höherer Hirnnetzwerke und könnten so die endogene und exogene Informationsprozessierung beeinträchtigen.

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NOTIZEN

**52** Veränderungen der Stressresponsivität bei frühen Missbrauchserfahrungen und Alkoholabhängigkeit

Mühlhan, Markus<sup>1</sup>; Höcker, Anja<sup>2</sup>; Trautmann, Sebastian<sup>3</sup>; Miller, Robert<sup>3</sup>; Wiedemann, Klaus<sup>2</sup>; Schäfer, Ingo<sup>2</sup>

<sup>1</sup>Medical School Hamburg, Deutschland; <sup>2</sup>Universitätsklinikum Hamburg Eppendorf; <sup>3</sup>Technische Universität Dresden, Deutschland

Hintergrund: Alkoholabhängige Patienten, die Missbrauch und Vernachlässigung in der Kindheit erfahren haben zeigen einen schlechteren Verlauf der Störung und ein höheres Risiko des Rückfalls. Dabei wird eine veränderte Stressresponsivität als potentieller Einflussfaktor diskutiert. Ziel dieser Studie war es, alkoholabhängige Patienten mit und ohne frühe Misshandlungserfahrungen als auch gesunde Kontrollen hinsichtlich ihrer Stressresponsivität vergleichend zu untersuchen. Methode: Alkoholabhängige Patienten mit (C+A+; N=29) und ohne Misshandlung (C-A+; N=33) sowie gesunde Kontrollprobanden mit (C+A-; N=30) und ohne Misshandlung (C-A-; N=38) wurden 14 Tage nach der Entgiftung einer standardisierten psychosozialen Belastungssituation (Trierer Sozial Stress Test; TSST) unterzogen. Zur Bestimmung der Stressresponsivität wurden die alpha-Amylase Aktivität, Kortisol- und ACTH-Level als auch subjektive Bewertungen erfasst. Die kumulative Kortisolsekretion wurde zudem über Haarkortisolkonzentrationen gemessen. Ergebnisse: Unabhängig von frühen Misshandlungserfahrungen zeigten die alkoholabhängigen Patienten eine niedrigere Responsivität in allen physiologischen Parametern im Vergleich zu den gesunden Kontrollen. In Bezug auf die subjektiven Stress- und Angstreaktionen zeigte sich ein davon abweichendes Befundmuster mit klaren Effekten früher Misshandlungserfahrungen. Die größten Unterschiede wurden über alle subjektiven Ratings hinweg zwischen alkoholabhängigen Probanden mit und ohne Misshandlungserfahrungen gefunden. Die Haarkortisolkonzentrationen deckten den Zeitraum des Alkoholentzugs ab und waren in der Patientengruppe signifikant erhöht. Fazit: Die Alkoholabhängigkeit ist mit einer nachhaltigen Störung physiologischer Stresssysteme assoziiert. Die Diskrepanz zwischen physiologischer und subjektiver Reaktivität in Personen mit Missbrauchserfahrungen in der Kindheit könnten Defizite im Umgang mit belastenden Situationen widerspiegeln, die auch eine Bedeutung für die Rückfallgefährdung bei Patienten mit Alkoholabhängigkeit haben könnten.

**53** **Victims of War: Psychoendocrine and Self-Reported Evidence for the Impact of Traumatic Stress on Adolescents growing up during the Israeli-Palestinian Conflict**

Schindler, Lena<sup>1</sup>; Shaheen, Mohammed<sup>2</sup>; Saar-Ashkenazy, Rotem<sup>3,4</sup>; Bani Odeh, Kifah<sup>2</sup>; Soreq, Hermona<sup>5</sup>; Friedman, Alon<sup>3,6</sup>; Kirschbaum, Clemens<sup>1</sup>

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**Background:** While the detrimental effect of traumatization, and especially prolonged traumatic stress on physical and mental well-being is undisputable, particularly for children and adolescents growing up under such conditions, the exact mechanisms on underlying biopsychological mechanisms are yet to be understood. The hypothalamic-pituitary-adrenal (HPA) axis relevant for endocrine stress responses is considered a crucial factor, with many studies already showing patterns of dysregulation in traumatized individuals.

**Method:** In order to better understand the impact of long-term traumatic stress on the HPA axis, we investigated self-reported well-being and psychopathology in 233 Palestinian adolescents growing up in the West Bank during the Israeli-Palestinian conflict. As a long-term marker for aberrant HPA axis secretion, hair cortisol concentrations (HCC) were examined in combination with relevant psychometric data.

**Results:** High rates of psychopathology emerged, with substantial levels of anxiety and depression, more than half of the participants reporting traumatization, and 40% fulfilling the criteria of posttraumatic stress disorder (PTSD). HCC proved to be significantly elevated in adolescents with likely PTSD compared to non-traumatized ones ( $p = .046$ ), and was associated with typical sequelae of traumatic stress. Notably, in traumatized individuals, Sense of Coherence was inversely related to self-reported psychopathology as well as to HCC.

**Discussion:** The alarming rates of psychopathology in Palestinian adolescents living in the West Bank paint a bleak picture of the sequelae of growing up during violent conflicts, and show the necessity for interventions. Further

research on Sense of Coherence as possible starting point is required.

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NOTIZEN



**54 Frontale EEG-Alphaasymmetrie bei Jugendlichen mit Depression: Einfluss von Erkrankungsstatus und komorbider Angststörung**

Feldmann, Lisa<sup>1</sup>; Piechaczek, Charlotte<sup>1</sup>; Pehl, Verena<sup>1</sup>; Bartling, Jürgen<sup>1</sup>; Grünewald, Barbara<sup>1,2</sup>; Schulte-Körne, Gerd<sup>1</sup>; Greimel, Ellen<sup>1</sup>

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In Ruhe-EEG Studien weisen Patienten mit einer akuten sowie remittierten Depression im Vergleich zu einer Kontrollgruppe eine größere rechts- als linksfrontale Aktivität auf, was mit Rückzugsverhalten und negativem Affekt assoziiert wird. Die wenigen Studien zu depressiven Jugendlichen liefern widersprüchliche Ergebnisse, was durch die unterschiedlichen Einschlusskriterien für die klinischen Stichproben erklärt werden kann. Studien im Erwachsenenbereich weisen darauf hin, dass komorbide Angststörungen die frontale Alphaasymmetrie beeinflussen. Daher ist nicht abschließend geklärt, ob depressive Jugendliche Abweichungen in der frontalen Alpha-Aktivität aufweisen und inwieweit derartige Abweichungen nur während akuter Phasen vorliegen (State-Merkmal) oder nach Remission persistieren (Trait-Merkmal). Zudem ist unklar, ob die frontale Alpha-Aktivität bei Jugendlichen durch komorbide Angststörungen beeinflusst ist.

Um dieser Fragestellung nachzugehen, wurde im Rahmen einer querschnittlichen Studie bei n=22 Jugendlichen mit einer aktuellen depressiven Episode ohne Angststörung, n=23 Jugendlichen mit einer aktuellen depressiven Episode mit einer komorbiden Angststörung, n=16 Jugendlichen mit remittierter Depression ohne komorbide Angststörung sowie n=22 gesunden Jugendlichen im Alter von 13-18 Jahren ein 8-minütiges EEG im Ruhezustand abgeleitet. Während depressive Jugendliche mit Angststörung eine relative rechtsfrontale Asymmetrie im Vergleich zu der Kontrollgruppe aufwiesen, zeigten sich keine Lateralitätsunterschiede zwischen den anderen beiden klinischen Gruppen und der Kontrollgruppe. Die frontale Alphaasymmetrie scheint bei der adoleszenten Depression nicht in Abhängigkeit vom Erkrankungsstatus zu variieren. Vielmehr scheint die komorbide Angststörung bei depressiven Jugendlichen ausschlaggebend für das Vorliegen einer relativen rechtsfrontalen Asymmetrie zu sein. In zukünftigen Studien sollte überprüft werden, ob hierfür die Angststörung allein oder das Zusammenspiel beider Störungen ursächlich ist, um zugrunde liegende biologische Mechanismen besser zu verstehen.

**55 Acceptance-based strategies and distraction decrease pain perception**

Haspert, Valentina<sup>1</sup>; Reicherts, Philipp<sup>1</sup>; Pauli, Paul<sup>1</sup>; Wieser, Matthias J.<sup>1,2</sup>

<sup>1</sup>University of Würzburg, Germany; <sup>2</sup>Erasmus University Rotterdam, Netherlands

Various emotion regulation strategies such as acceptance can effectively reduce pain perception. But it is still unclear under which circumstances acceptance is more or less effective than other strategies. We administered tonic heat and phasic electrical pain stimuli and compared acceptance-based strategies with a neutral control condition and a well-established distraction task. Forty healthy participants received instructions about all conditions and practiced them before the actual experiment. The heat and electrical pain stimuli were adjusted to the participants' individual pain threshold. Cues indicating the condition were presented, followed by either 10s of heat pain or 20ms of electrical stimulation. After each trial, pain intensity and unpleasantness ratings were gathered. Additionally, heart rate (HR) and skin conductance (SC) were recorded. Analysis of ratings showed a significantly decreased pain perception for both acceptance and distraction compared to control condition for heat and electrical pain. Only the heat pain intensity for acceptance compared to control did not differ significantly. Psychophysiological measures revealed a significantly lower SC level for acceptance compared to control condition during heat pain stimulation, whereas all other condition differences for both pain modalities failed significance. Our results show that acceptance and distraction are effective strategies for reducing the subjective perception of tonic heat and phasic electrical pain. Results indicate that acceptance may be more efficient in reducing psychophysiological indices of pain rather than sensory pain perception. To investigate further mechanisms, future studies should compare acceptance with other established emotion regulation strategies such as reappraisal and use different pain stimulation durations.

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NOTIZEN

**56 Impaired filter function in patients with somatoform disorders and major depression, as reflected by auditory evoked potentials in an oddball and an active distraction paradigm**

Hutmacher, Djenna<sup>1</sup>; Dierolf, Angelika<sup>1</sup>; Lutz, Annika<sup>1</sup>; Vögele, Claus<sup>1</sup>; Vorderholzer, Ulrich<sup>2</sup>; Koch, Stefan<sup>2</sup>; Bach, Michael<sup>3</sup>; Asenstorfer, Carina<sup>3</sup>; Mertens, Vera-Christina<sup>1</sup>; Schulz, André<sup>1</sup>

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**Introduction:** In the influential perception-filter model of somatoform disorders (SD), three stages of symptom perception are postulated: (1) bodily signals, which may be amplified by stress, (2) a filter system, which distinguishes between relevant and irrelevant stimuli, and (3) cortical perception of physical symptoms. As there is dearth of evidence so far supporting the relationship between (1) bodily signals and (2) filter processes in SD, this study investigated if filter processes are altered in SD and if stress may affect filter mechanisms.

**Methods:** Twenty-four patients with SD, 24 with depression and 24 healthy control individuals were assessed. Event-related potentials (ERPs) with two different auditory distraction procedures were recorded over four blocks, one before and three after either a socially evaluated cold pressor test (SECPT) or a control procedure. We manipulated both the frequency of and the attentional focus on stimuli to reflect filter processes.

**Results:** We found smaller P3b amplitudes (reflecting memory storage) in patients with depression and SD, as compared to healthy controls. Furthermore, both patient groups showed a smaller P3a amplitude (reflecting attention), when counting the infrequent tone (“Oddball task”) and a smaller N1 amplitude when counting the frequent tone (“active distraction”). In patients with SD, the SECPT had a decreasing effect on P3a amplitudes.

**Conclusions:** Both late filter processes, reflecting attention (P3a) and memory storage (P3b), may be impaired in SD and depression. As acute stress affected attention in SD patients only, the impact of bodily signals (1) on filter processes (2) may be specific for SD.

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NOTIZEN:

**57** The posterior semantic asymmetry – semantic activation specific to visual words?

Koppehele-Gossel, Judith; Schnuerch, Robert; Gibbons, Henning

University of Bonn, Deutschland

The present study replicates the findings of the posterior semantic asymmetry (PSA; Koppehele-Gossel, Schnuerch, & Gibbons, 2016, *Brain and Language*, 157, 35-43), an event-related potential (ERP) reflecting semantic processing of visually presented single words. This ERP negativity, derived from the subtraction of right-side from left-side scalp activity, peaked around 300 ms at temporoparietal electrodes and was most pronounced in a semantic task condition. With exactly the same task conditions the PSA to visual words was replicated, but no comparable negativity was observed for auditory presented words. This suggests that the PSA specifically reflects visual-verbal semantic processing. Instead, for auditory words a later variation by task conditions, differing in the demands on semantic processing, was observed for a component with positive polarity, which showed a similar topography like the PSA. Furthermore, another interesting finding was that the occurrence of the PSA to visual words was altered within participants who previously heard auditory words.

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NOTIZEN:

**58 Späte Effekte von psychosozialen Stress auf die Entscheidungsfindung: die Vertrautheit mit der Entscheidungssituation - macht den Unterschied**

Nowacki, Jan; Düsenberg, Moritz; Deuter, Christian; Otte, Christian; Wingenfeld, Katja

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Im Alltag werden viele Entscheidungen unter Stress getroffen, wobei risikoreichere Entscheidungen aber auch eine erhöhte Angst vor Verlusten („Loss Aversion“) nach Stress beobachtet wurden. Es existieren Hinweise darauf, dass die Effekte von Stress auf kognitive Prozesse zeitabhängig sind. Bezüglich der Entscheidungsfindung wurden bislang überwiegend akute Stresseffekte untersucht.

In dieser Studie untersuchten wir, inwieweit psychosozialer Stress auch zeitverzögert zu einer erhöhten Risikobereitschaft führt. In einem messwiederholten Design wurden 32 Frauen mit dem Trier Social Stress Test (TSST) und einer Kontrollbedingung (Placebo-TSST) im Abstand von einer Woche untersucht, wobei die Reihenfolge randomisiert war. Nach 80 Minuten wurde der Balloon Analogue Risk Task (BART) durchgeführt. Die psychophysiologische Stressreaktion wurde anhand der Cortisol- und Alpha-Amylase Konzentration sowie des Blutdrucks gemessen.

Der TSST führte zu einer erhöhten physiologischen Stressreaktion im Vergleich zum P-TSST. Bezüglich der Risikobereitschaft fanden wir einen signifikanten Stresseffekt mit einer geringeren Risikobereitschaft nach dem TSST im Vergleich zum P-TSST. Zudem fanden wir eine Interaktion zwischen Stress und Reihenfolge von TSST / P-TSST. Psychosozialer Stress führte nur zu einer geringeren Risikobereitschaft, wenn die Entscheidungssituation für die Teilnehmer unbekannt war, also wenn der TSST zuerst stattgefunden hatte.

Unser Befund stärkt die Hypothese, dass psychosozialer Stress zu einer verringerten Risikobereitschaft führt, zumindest in einem Abstand vom Stressor von etwa einer Stunde. Dies scheint jedoch vor allem für neue und nicht für vertraute Entscheidungssituationen zu gelten. Zukünftige Studien sollten Effekte von Stress auf die Entscheidungsfindung unter Berücksichtigung früher und später Stresseffekte weiter untersuchen und dabei auch Vertrautheit mit der Entscheidungssituation berücksichtigen.

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NOTIZEN:

**59** “I remember that” - Social context amplifies ERP responses and simultaneously enhances and biases memory performance

Schindler, Sebastian<sup>1,2</sup>; Johanna, Kissler<sup>2</sup>

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In the age of virtual communication, the source of a message is often not directly perceived but rather implied. Still, in a recent series of ERP studies, attributed ‘human’ feedback was compared to computer feedback. In reality, all conditions contained random but counterbalanced feedback. Following from this, the present study examines ERP responses and memory encoding for such social feedback settings. In an experimental group, participants received “human”- and “computer”-feedback based on positive, negative, or neutral adjectives and could agree with the feedback or not. Not surprisingly, acceptance was highest for positive and lowest for negative adjectives, but also overall higher for “human” feedback. The enhanced relevance of positive feedback is reflected in substantially enhanced LPP amplitudes, while at earlier stages a selectively increased EPN for positive “human” feedback was observed. In a control group, participants were instructed to learn the very same stimuli. Although the recognition test one week after testing was unexpected for the social feedback group, memory accuracy was higher than in the instructed-learning group. Further, a response bias, leading to more frequent old response for positive words, was observed in both groups, but significantly larger in the experimental group. Finally, an even more liberal response bias was found for originally “human” feedback. These findings show that attributed sender identity not only enhances feedback-processing, but also subsequently memory formation. Specifically, in social contexts, our brains ultra-rapidly differentiate between relevant and irrelevant information. This can lead to better encoding, however, also to larger response biases.

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NOTIZEN:

**60 Error detection sensitivity moderates the relationship between response detection and error negativity**

Mattes, André; Bauer, Cirsten; Meyer, Thomas; Stahl, Jutta

Universität zu Köln, Deutschland

In error processing research, researchers usually made use of paradigms with binary response alternatives and found that the error negativity (Ne) - a component of the event-related potential which occurs after having committed an error - peaks higher than the correct response negativity (Nc) which can be observed after correct responses. In an eight response alternative paradigm, participants (N=30) had to respond to one of eight stimuli and subsequently indicate by a confidence rating how certain they were about the correctness of the response. Interestingly, our study did not replicate the usually reported differences between the components' peaks. Instead, participants showed a higher negativity in trials with undetected responses (both correct and erroneous) compared to detected responses (both correct and erroneous). A moderator analysis revealed that this difference was only significant for participants with medium to high error detection sensitivity ( $d'$ ). These results can be explained in terms of the conflict monitoring theory of the Ne which postulates that the Ne is an indicator of a motor response conflict. Participants with a high  $d'$  may have shown more undetected responses accompanied by a high Ne/Nc due to the preceding response conflict. For detected responses, the Ne/Nc may have peaked lower due to a smaller response conflict. For participants with a low  $d'$ , however, the response detection was rather independent of the preceding response conflict. Accordingly, undetected responses did not indicate response conflict and no increased Ne/Nc was found. Further research needs to be conducted to uncover the underlying mechanisms.

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NOTIZEN:

**61** Neural correlates of intentional and non-intentional voice learningZäske, Romi<sup>1</sup>; Humble, Denise<sup>1</sup>; Dobel, Christian<sup>1</sup>; Schweinberger, Stefan R.<sup>2</sup><sup>1</sup>Universitätsklinikum Jena, Deutschland; <sup>2</sup>Friedrich-Schiller-Universität Jena, Deutschland

Recent electrophysiological data suggest a rapid acquisition of novel speaker representations during intentional voice learning. We investigated effects of learning intention on voice recognition, using a variant of the directed forgetting paradigm. In an old/new recognition task following voice learning, we compared performance and event-related brain potentials (ERPs) for studied voices, half of which had been prompted to be remembered (TBR) or forgotten (TBF). To assess incidental encoding of episodic information, participants indicated for each recognized test voice the ear of presentation during study. During study, TBR voices elicited more positive ERPs than TBF voices (from ~250 ms), possibly reflecting deeper voice encoding. In parallel, subsequent recognition performance was higher for TBR than for TBF voices. Importantly, above-chance recognition for both learning conditions nevertheless suggested a degree of nonintentional voice learning. In a surprise episodic memory test for voice location, above-chance performance was observed for TBR voices only, suggesting that episodic memory for voice location depended on intentional voice encoding. At test, a left posterior ERP OLD/NEW effect for both TBR and TBF voices (from ~500 ms) reflected recognition of studied voices under both encoding conditions. By contrast, a right frontal ERP OLD/NEW effect for TBF voices only (from ~500 ms) possibly reflected additional elaborative retrieval processes. Overall, we show that ERPs are sensitive to strategic voice encoding during study (from ~250 ms), and to voice recognition at test (from ~500 ms), with the specific pattern of ERP OLD/NEW effects partly depending on previous encoding intention.

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NOTIZEN:



**62 Good Memory, Less Technology: Strong Memory Traces Decrease Reliance on External Information**

Weis, Patrick; Wiese, Eva

George Mason University, USA

Humans frequently use external resources to supplement their brain-based thought, an activity called cognitive offloading. For example, even comparably easy arithmetic is oftentimes outsourced to a computer. It is well-established that efficiency parameters of the external resource, e.g. access time, alter offloading frequency. It however is less clear whether efficiency parameters of the internal, i.e. brain-based, resources equally alter offloading frequency. To address this question, we presented two blocks of alphanumerical equations (e.g.,  $A + 2 = C$ ) to 114 participants. In the first block, the learning block, participants had to exclusively rely on their brain-based processing to decide whether the equation is correct. In the second block, participants were able obtain external support: hovering the mouse cursor over a small black box would reveal the correct answer. We manipulated difficulty (+ 2: low, + 3: medium, + 4: high) and memory trace (32 learning trials: weak, 64 learning trials: medium, 128 learning trials: strong), and hypothesized that offloading frequency should increase with task difficulty and decrease with the accessibility of the solution in brain-based memory. Our results confirm the hypothesis and thereby indicate that humans are able to flexibly adjust the way they exploit environment-based information based on the costs of internal memory access.

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NOTIZEN:

**63** Examining the Effect of Belief Bias in Cognitive Offloading

Weis, Patrick; Wiese, Eva

George Mason University, USA

Lately, the hypothesis that the human cognitive system is tightly coupled to the external world is gaining much attention in the cognitive sciences. Such a distributed cognitive system encompasses internal brain-based and external environment-based resources. For the system to work efficiently, it is crucial to recruit the right resources at the right time. But what influences whether internal or external resources are recruited for a specific task? There is a large body of research suggesting that objective parameters like the external resource's efficiency heavily influence recruitment. However, there is also growing evidence that less objective parameters like metacognitive judgments influence recruitment. Here, we asked 114 participants to solve a cognitive task while concurrently altering an objective efficiency parameter (the external resource's reliability) as well as a metacognitive parameter (reliability beliefs: people were informed about how frequently they can expect the external resource to work). Importantly, we sometimes provided downwardly biased information (e.g. 60% reliability when the actual reliability was 90%). We hypothesized that presenting such downwardly biased information biases recruitment and thereby decreases the cognitive system's efficiency. The results confirm our hypothesis, showing that external resource recruitment not only depends on the resource's efficiency but also on the beliefs about the efficiency. Thus, humans' decisions to recruit external resources are not always reflecting their actual benefit. In sum, our study emphasizes the importance of rather "subjective" variables like reliability beliefs on top of "objective" variables like actual reliability for the human distributed cognitive system.

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NOTIZEN:

**64** Generalizing age effects on brain structure and cognition – a two-study comparison approach

Jockwitz, Christiane<sup>1,2,3</sup>; Mérillat, Susan<sup>4</sup>; Liem, Franz<sup>4</sup>; Oschwald, Jessica<sup>4</sup>; Amunts, Katrin<sup>1,3,5</sup>; Caspers, Svenja<sup>1,3,5,7</sup>; Jäncke, Lutz<sup>4,6,7</sup>

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Normal aging is accompanied by a decline in cognitive abilities [1] and brain structure [2], with high inter-individual variability, especially in older age [3]. This variability, combined with differences in sample characteristics and methods used across studies, pose a major challenge for generalizability of results from different studies. The current study aimed at cross-validating age-related differences in cognitive abilities and brain structure in two large independent samples of healthy older adults (Longitudinal Healthy Aging Brain (LHAB) database, University of Zurich [4] and 1000BRAINS, Research Center Juelich [5]). 228 participants per site (mean age: 71 +/-5 years) were compared regarding education, physical/mental well-being and selected cognitive abilities. Mean cortical thickness (CT) was calculated based on T1-weighted images for both hemispheres and regions of the Default Mode Network (DMN) [7]. Age-related differences in brain structure and cognitive abilities were assessed using General Linear Models for each sample that were subsequently compared using Steiger's-Z. LHAB subjects showed significantly ( $p < .05$ ) higher education, physical well-being as well as all cognitive abilities measured. CT values were larger in 1000BRAINS. When assessing age-related differences in cognitive abilities and CT, though, both samples showed highly similar effects, in accordance with functional aging theories, e.g. posterior to anterior shift in aging as shown for the DMN [9]. Thus, the current two-study approach suggests that although general metrics of brain structure or cognition might be heterogeneous across studies, age-related effects on cognitive ability and brain structure can be generalized over different samples, assuming the same methodology is used.

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NOTIZEN:

**65** Impact of 3-day combined atDCS -visuospatial training on object-location memory in older subjects with and without memory impairment

Vieira Cavalcanti de Sousa, Angelica<sup>1</sup>; Külzow, Nadine<sup>1,2</sup>; Flöel, Agnes<sup>1,3</sup>

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Mild Cognitive Impairment (MCI) refer to a transitional stage between normal aging and Alzheimer's disease (AD). Notably, object-location memory (OLM) is one of the earliest function to be affected. Given that the transition can take years and that major brain pathology is already present in AD, early therapeutic approaches with the aim to beneficially influence function and possibly also the disease process during preclinical phase receive increasing attention. Here, we combined two neuroplasticity-enhancing approaches: cognitive training and anodal transcranial direct current stimulation (atDCS). In a single-blind cross-over design 14 MCI patients and 32 healthy elderly individuals (HE) underwent a 3-day visuospatial (OLM) training paired with either 20min or 30s (sham) atDCS (1mA, right temporoparietal cortex). Mixed Model analyses were performed to investigate impact on immediate (training success) and longer-term memory (1-month). While no effects were found for longer-term memory, atDCS significantly improved training success of MCI, up to the level of HE. In HE, however, no difference between atDCS and sham was obtained. Further post-hoc analysis determining within- and between-session (on vs. offline) effects across training days indicating that MCI benefited from atDCS "online" but not "offline" contrary to HE. Our findings demonstrate that a combined intervention can improve OLM in MCI. Moreover, the data suggests differential mechanisms of action in MCI vs HE. These encouraging findings should now be followed up with larger cohorts.

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NOTIZEN:

**66 Influence of pre-sleep social media consumption on sleep and sleep-associated memory consolidation**

Combertaldi, Selina L; Rasch, Björn

Universität de Fribourg, Schweiz

Sleep is critical for our mental health and optimal cognitive functioning, including consolidation of memories during sleep. Particularly shortly before bedtime, social media use is increasingly common and might affect both sleep as well as sleep-associated memory consolidation. However, the strength of these effects is unknown. Here we tested the effects of social media use (i.e., WhatsApp, Snapchat) on subsequent sleep and sleep-associated memory consolidation and compared it to a relaxation and a control condition. We predict that the use of pre-sleep social media consumption will worsen sleep and sleep-associated memory consolidation due to increases of arousal, whereas relaxation training will induce sleep and memory benefits as compared to a normal sleep condition.

Twenty-five 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 (EEG, EOG, EMG, EKG) and subjective sleep quality was measured during all four nights. In the three experimental nights, participants had either to use social media in the last hour before sleep, listen to a relaxation tape, or directly go to sleep, in a balanced order.

Pilot analyses show that the subjective and objective sleep onset latency was differentially affected by the Social Media and Relaxation condition. However, sleep-associated memory consolidation was unaltered by the experimental condition. Our results raises concerns against the use of Social Media shortly before sleep time.

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NOTIZEN:

**67** Dreaming of a learning task improves memory performance

Schönauer, Monika<sup>1</sup>; Kirchner, Susanne<sup>2</sup>; Schneider, Maximilian<sup>2</sup>; Graetz, Marcel<sup>2</sup>; Gais, Steffen<sup>1</sup>

<sup>1</sup>Universität Tübingen, Deutschland; <sup>2</sup>LMU München, Deutschland

Neuronal activity observed during learning is replayed in later sleep periods. We assume that this reactivation underlies beneficial effects of sleep on memory retention. In humans, sleep states are accompanied by vivid conscious experience during dreams. Dreams have long been known to contain residues of daytime experiences. Here, we tested whether the content of previous learning can be inferred from dream reports, and whether dreaming is related with overnight memory retention. 20 participants listened to one of four different audiobooks while falling asleep. During the night, they were awoken several times from NREM sleep and asked to report their dreams. We then tested how well they remembered the content of the audiobook. This procedure was repeated multiple times throughout the night. To assess whether the specific content of an audiobook is reprocessed in subsequent dreams, three independent and blind raters were asked to guess, based on transcripts of the dream reports alone, which audiobook someone had listened to before sleeping. Dream reports could be successfully matched with the corresponding audiobook condition (Cohen's  $\kappa = 0.20$ ,  $p = 0.02$ ). The amount of information that was reprocessed during dreams, measured as the stated confidence with which raters made their decision, correlated significantly with later memory for the listened audiobook passage ( $r = 0.37$ ,  $p = 0.02$ ). We thus conclude that new memories are reprocessed during subsequent dreams. Moreover, this memory reprocessing during NREM dreams is associated with better retention of the information, indicating that dreams may indeed reflect overnight memory processing.

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NOTIZEN:

**68 A fast track to the neocortex: Long-term memory representations in the parietal cortex**

Brodts, Svenja<sup>1,2</sup>; Gais, Steffen<sup>1</sup>; Erb, Michael<sup>2</sup>; Beck, Jonas<sup>1</sup>; Scheffler, Klaus<sup>2</sup>; Schönauer, Monika<sup>1,2</sup>

<sup>1</sup>Institute of Medical Psychology and Behavioral Neurobiology, University of Tübingen, Germany; <sup>2</sup>MPI for Biological Cybernetics, Tübingen, Germany

Traditional models of systems memory consolidation postulate two interacting memory stores, with rapid encoding of new information supported by the hippocampus and a gradually developing, stable storage in neocortical circuits. Recently, the posterior parietal cortex (PPC), particularly the precuneus, has been proposed as a cardinal location of neocortical long-term memory. We have shown functional activity in this area over repeated learning that is memory specific, long-term stable and related to memory accuracy. To conclusively identify the PPC as a location of memory storage, learning-contingent, lasting structural changes have to be demonstrated as well.

Here, we used diffusion MRI to assess changes in brain microstructure, which reflect neuronal plasticity. 41 participants learned object-place associations over 8 learning-recall repetitions in two sessions. Task-related activity was tracked with fMRI. Structural changes were assessed with dMRI at three time points (before, 90 minutes and 13 h after learning). A non-learning condition measured at the same times was employed as control.

Functional PPC activity increases with learning repetitions, remains stable over a 13-h period and strongly correlates with recall performance. Furthermore, decreases in mean diffusivity indicate structural changes in the same area, which also develop after learning, remain stable for over 12 hours and correlate with behavioral performance.

We thus show functional and structural changes in the PPC that fulfill all requirements for a neocortical long-term memory representation: learning specificity, long-term stability and behavioral relevance. The confirmation of structural plasticity in particular proves the importance of the PPC as a site of neocortical memory storage.

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NOTIZEN:

**69** Reading prevails: Automatic word recognition in a single-letter Stroop task

Quent, Jörn Alexander<sup>1,2</sup>; Meyer, Marcel<sup>1,3</sup>; Ros, Tomas<sup>4</sup>; Kuchinke, Lars<sup>1,5</sup>

<sup>1</sup>Fakultät für Psychologie, Ruhr-Universität Bochum; <sup>2</sup>MRC Cognition and Brain Sciences - University of Cambridge; <sup>3</sup>Klinische und Biologische Psychologie und Psychotherapie - Universität Mannheim; <sup>4</sup>Department of Fundamental Neurosciences - University of Geneva; <sup>5</sup>International Psychoanalytic University Berlin

The notion that word recognition is an automatic process has been repeatedly challenged. To revisit this issue, we investigated the semantic Stroop effect with the single letter colouring (SLC) procedure in which a target letter was cued and the spaces between the letters were filled with special characters. Furthermore, we recorded continuous electroencephalography (EEG) data for subsequent event related potential (ERP) analysis and measured item recognition performance for stimuli used in the Stroop task to study the automaticity of word recognition. A semantic Stroop effect was not detectable in classical behavioral data regardless of whether all letters were coloured or just a single letter. However, a significantly negative ERP deflection between 420 msec and 520 msec indicating Ninc and/or N400 ERP and a significant memory effect were present. Both of which were not modulated by SLC. In conclusion, item recognition performance and ERP results suggest that word recognition is automatic and can be measured even though it is not evident in classical behavioral data. Prominent models of automatic word recognition such as the parallel distributed processing model need to be updated to account for the reduction of response conflict in behavioral data.

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NOTIZEN:



**70** Nutritional content influences reward learning processes

Bellucci, Gabriele<sup>1</sup>; Ulrich, Anja<sup>2</sup>; Tardu, Jeremy<sup>2</sup>; Uhl, Olaf<sup>3</sup>; Koletzko, Berthold<sup>3</sup>; Schmid, Sebastian M.<sup>2,4</sup>; Park, Soyoung Q.<sup>1</sup>

<sup>1</sup>Department of Psychology I, University of Lübeck, Germany; <sup>2</sup>Department of Internal Medicine I, University of Lübeck, Germany; <sup>3</sup>Dr. von Hauner Children's Hospital, University of Munich Medical Center, Ludwig-Maximilians-Universität Munich, Germany; <sup>4</sup>German Center for Diabetes Research (DZD), Neuherberg, Germany

Modulation in food's macronutrient ratio alters blood plasma tyrosine level, which is linked to brain dopamine level change. Previous studies have shown that different food's macronutrients impact social decisions in economic games. However, it is still unknown whether a change in macronutrient composition is enough to modulate reinforcement learning processes. In a randomized, within-subject design, 30 male participants were submitted with two different breakfasts in two sessions separated by at least 7 days. Both sessions were identical except for the macronutrient composition of the breakfast. Three hours later, participants performed a reversal learning task. Using a computational reinforcement learning model, we investigated whether participants' learning processes were affected by food-induced increases in tyrosine levels in the low carbohydrate/high protein (low carb/prot) as opposed to the high carbohydrate/low protein session (high carb/prot). Model parameters revealed that participants valued feedback information differently depending on the macronutrient composition of the breakfast. In particular, a low carb/prot breakfast as compared to a high carb/prot breakfast reduced the value participants ascribed to negative but not to positive feedback. These findings suggest that different food's macronutrients have an impact on how reward and punishment information is used to adjust behavior. Our results demonstrate that one and the same participant shows a different learning profile depending on the acute macronutrient composition of the breakfast, highlighting the importance of a balanced diet for the field of education, economics, health and public policy

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NOTIZEN:

**71** Expectation violations are not expectation violations – Neural responses to unpredicted reward omission and unpredicted punishment differ during a simple reversal learning task

Stolz, Christopher; Mueller, Erik

University of Marburg, Germany

While the neural processing of expectation violations is a core feature of behavioral adaptation it is unclear to which degree early brain responses to violated expectations differ as a function of the consequence of prediction failure. Here,  $n = 16$  human participants underwent one reward-related and one punishment-related 280-trial probabilistic reversal learning paradigm. Feedback in the reward paradigm signaled monetary reward (+10 Cent) vs. nonreward (+0 Cent) and feedback in the punishment paradigm signaled nonpunishment (no noise burst) vs. punishment (noise burst titrated to match aversiveness of monetary nonreward). Participants had to choose between two symbols, which differed in their associated reward/nonpunishment vs. nonreward/punishment probabilities (70 vs. 30%). Contingencies switched (i.e. 30 vs. 70%) whenever one of three reversals occurred. Participants were asked to rate how much they expected the desired outcome (reward and nonpunishment, respectively) after every decision. While behavioral results were comparable for the two paradigms, preliminary event-related potential and single-trial EEG analyses revealed differential effects of expectation and feedback valence on reward-related vs. punishment-related feedback processing. Importantly, the analysis of the late positive potential (LPP) revealed a significant interaction of paradigm  $\times$  expectation  $\times$  feedback valence, indicating larger LPP amplitudes following unexpected punishment as opposed to unexpected nonreward. Under the literature-based assumption that centroparietal brain activity in the LPP time window indicates motivational salience, our results indicate that expectation violations that lead to potential punishment are more motivationally salient than expectation violations leading to reward omissions.

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NOTIZEN:

**72 Die Gamma Model Analyse – Vorstellung einer neuen Methode zur Auswertung der Form von Ereigniskorrelierten Potentialen**

Kummer, Kilian; Stahl, Jutta

Universität zu Köln, Deutschland

Für die Untersuchung von Ereigniskorrelierten Potentialen (EKP) werden meist die individuellen Peaks oder die Flächen der EKP-Komponenten verschiedener experimenteller Bedingungen gegeneinander auf Signifikanz geprüft. Problematisch hierbei ist, dass diese klassischen Methoden nicht die wesentlichen individuellen Unterschiede hinsichtlich der Form der EKP-Komponenten berücksichtigen. Damit diese zusätzlichen Informationen aus EKP-Komponenten extrahiert werden können, soll hier eine neue Methode zur Untersuchung vorgestellt werden, die Gamma Model Analyse (GMA). Diese ermöglicht es, mithilfe mathematischer Modellanpassung von Gammafunktionen an EKP-Komponenten zeitabhängige Parameter (Wendepunkte und Modalwert) und formabhängige Parameter (Schiefe und Kurtosis) zu berechnen. Der Gamma Modell Fit Ansatz verwendet hierbei einen angepassten Grid-Restrained Nelder-Mead Simplex Algorithmus, der für jede EKP-Komponente die genannten individuellen Parameter berechnet. Das Vorgehen wird am Beispiel der Fehlernegativität in einer Zahlenflankeraufgabe und einer Kraftproduktionsaufgabe dargestellt. Die Ergebnisse der Modellanpassung sind vielversprechend und zeigen im Vergleich zu traditionellen Methoden zusätzliche Varianzaufklärung.

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NOTIZEN:

**73** The temporal dynamics of the brain's multisensory causal inferences

Rohe, Tim<sup>1</sup>; Ehlis, Ann-Christine<sup>1,2</sup>; Noppeney, Uta<sup>3</sup>

<sup>1</sup>Department of Psychiatry and Psychotherapy, University Hospital of Tuebingen, Tuebingen, Germany; <sup>2</sup>LEAD Graduate School and Research Network, University of Tuebingen, Tuebingen, Germany; <sup>3</sup>Centre for Computational Neuroscience and Cognitive Robotics, University of Birmingham, Birmingham, United Kingdom

Humans integrate signals from multiple modalities to obtain more reliable multisensory representations of their environment. However, given the multitude of multisensory signals in any environment, the brain needs to integrate signals only if they arise from a common cause, but has to segregate signals from independent causes. Humans infer a common cause if they perceive a small temporal, spatial and structural disparity between multisensory signals. Current fMRI studies demonstrate that the brain implements such causal inference processes along a cortical hierarchy. However, the temporal dynamics of the brain's causal inference processes remain unknown.

In the current study, participants were presented with one to four synchronous flashes and beeps and they counted either the number of flashes or the number of beeps. As predicted by causal inference, participants integrated the signals if a small numeric disparity ( $\leq 1$ ) between the number of flashes and beeps suggested a common source, while the signals were segregated for a large disparity. A multivariate pattern analysis on EEG recordings decoded the number of presented signals with high accuracy starting from 150ms after stimulus onset. The decoding approach demonstrated that the brain first represented the signals' numeric disparity and computed the signals' likely causal structure. Next, the brain integrated the signals in case of a small numeric disparity, but segregated the signals in case of a large disparity. Before stimulus onset, EEG oscillations influenced participants' perceptual prior of the signal's likely causal structure. Overall, multisensory causal inference followed a specific temporal sequence along cortical hierarchies.

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NOTIZEN:

**74** The time course of force execution monitoring investigated by multivariate pattern analysis

Siswandari, Yohana; Stahl, Jutta

Universität zu Köln, Deutschland

Studies investigating monitoring activity during force production have provided evidence that upcoming errors were reflected in the Error Related Potential (ERP) up to 90 ms before an overt response. We therefore aimed to investigate if response-related information (correctness, response force and time-to-peak force/TTP) could be predicted from the ERP signal using multivariate pattern classification analyses (MVPA). A total of 48 participants (33 females) were tested in a 50-minutes experimental session. The 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). Each participant's artefact-free data was then grouped in to three conditions (correct, incorrect-too high, and incorrect-too low). This data was analyzed using a set of support vector machine classification (SVC) analyses with a moving analysis window approach, to see if information about correctness could be decoded from the participants' spatio-temporal brain activity pattern before and after the response onset. A set of support vector regression (SVR) analyses was then used to find the first point in time when the response parameters (response force and TTP) are decodable from the participants' brain activity pattern. The results of SVC analyses revealed that information regarding force magnitude – instead of correctness (error vs. correct response) – were decodable from the brain activity pattern. Furthermore, the SVR results indicated that the magnitude and timing of the upcoming force pulse was established before response execution

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NOTIZEN:

**75 The reward-like nature of social cues that indicate successful altruistic punishment**

Mussel, Patrick<sup>1</sup>; Hewig, Johannes<sup>2</sup>; Weiß, Martin<sup>2</sup>

<sup>1</sup>Freie Universität Berlin, Deutschland; <sup>2</sup>Julius-Maximilians-Universität Würzburg, Deutschland

Altruistic punishment is the attempt to penalize deviant behavior of another person even though it is accompanied by personal costs. Here, we investigated the influence of the reaction on the socio-emotional level of the other person following altruistic punishment behavior on future decision-making and neural responses. We therefore used a modified Ultimatum Game which included an emotional facial feedback of the proposer following the decision of the participant. We found higher acceptance rates for proposers showing a smile upon acceptance or a sad face upon rejection of an offer, compared to proposers showing a neutral facial expression. Interestingly, we found no difference between an angry face upon rejection of an offer, compared to a neutral expression, presumably because the angry face was interpreted as a signal of confrontation and non-approval in terms of not caring about the punishment and pursuing unfair behavior in the future. On the neural level, we found a reversed N2 effect for negative emotional faces in the context of altruistic punishment, compared to a control condition. Specifically, when following the rejection of an unfair offer, negative emotional faces showed a reward-like positivity which might signal successful altruistic punishment. In addition, differential effects for P3 amplitudes might signal the subjective importance of a desired outcome. Our results are in line with the interpretation that rejection of unfair offers in the Ultimatum game is due to intended altruistic punishment. Social cues may exhibit reward-like properties when indicating successful altruistic punishment and can influence subsequent decision-making.

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NOTIZEN:

**76 The MFN as an indicator for lies of different moral qualities: A comparison of the results based on a peak and a mean amplitude measurement**

Scheuble, Vera; Beauducel, André

Universität Bonn, Deutschland

Do specific circumstances impair the detection of deception by event-related potentials? Individual differences and which kind of lie is told could play a critical role in this context. The Medial Frontal Negativity (MFN) has already been related to deception and conflicts in previous studies. In the present study we compared the MFN-amplitude during lies of different moral qualities and honest responses. In addition, the moderating influence of sex, justice sensitivity and Machiavellianism was analyzed. During a computer task participants (N=95) spontaneously lied or told the truth. Their answers had different consequences depending on the condition they were randomly assigned to. Some participants could take money from a charity organisation by lying (egoistic lies). Others could give their money to a charity organisation (altruistic lies). The final subgroup got money independent of deceptive or honest answers (neutral lies). The amplitude was quantified by a single as well as a mean peak. The following results were found with both methods. Perpetrator sensitivity of injustice had no influence on the MFN-amplitude. When participants could lie egoistically, different patterns of the MFN appeared depending on the Machiavellianism score: Participants scoring low on Machiavellianism showed a more negative MFN-amplitude for lies compared to true answers. However, for individuals with a high Machiavellianism score the MFN-Amplitude was more negative for honest relative to deceptive responses. Moreover, for females an increased MFN occurred for lies compared to truthful answers. The results of both quantifications of the amplitude will be contrasted and discussed.

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NOTIZEN:

**77 Fehlerverarbeitung und Narzissmus: eine explorative Untersuchung ereigniskorrelierter Potentiale bei der Begehung von selbstwertbedrohlichen Handlungsfehlern**

Mück, Markus

Universität zu Köln, Deutschland

Horvath und Morf (2009) zufolge ist die konzeptuelle und empirische Inkonsistenz hinsichtlich der Frage, ob Narzissmus einem vulnerablen Kern entspringt, in der Methodik gängiger Fragebogenuntersuchungen begründet. Erstens besitzen hochnarzisstische Personen womöglich keine bewusste mentale Repräsentation ihrer Wertlosigkeitsschemata, über die sie in Selbstbeschreibungsinventaren berichten könnten und zweitens würden sie – entsprechend ihrer Strategien der Selbstdarstellung - hierüber nicht berichten, selbst wenn sie diese besäßen. Es gibt in der Persönlichkeitsforschung Bestrebungen über rein korrelative Fragebogenstudien hinaus den Vulnerabilitätsaspekt von Narzissmus zu untersuchen (fMRT-Untersuchung von Jauk, Bendek, Koschutnig, Kedia & Neubauer, 2017; Primingstudie von Horvath & Morf, 2009). Die vorliegende Studie untersucht den Zusammenhang von neuronalen Korrelaten der Fehlerverarbeitung bei selbstwertbedrohlichen Handlungsfehlern und subklinischer Ausprägung von Narzissmus. Mit Hilfe einer zweigeteilten Speeded-Go/NoGo-Aufgabe (Vocat, Pourtois & Vuilleumier, 2008) werden Komponenten des ereigniskorrelierten Potentials (ERN, CRN, Pe, Pc), die im Zusammenhang mit Fehlerverarbeitung stehen, vor und nach einer (falschen) selbstwertbedrohlichen Leistungsrückmeldung untersucht. Es wird angenommen, dass Personen mit höheren Narzissmuswerten auf einer frühen Ebene der Informationsverarbeitung selbstwertbedrohliche Handlungsfehler intensiver verarbeiten (höhere ERN), dass diese Handlungsfehler zu einem späteren Zeitpunkt der Informationsverarbeitung jedoch weniger stark ins Bewusstsein gelangen als bei Personen mit geringeren Narzissmuswerten (geringere Pe), was im Sinne narzisstischer Vulnerabilität und überkompensierender Grandiosität gedeutet werden könnte. Die Ergebnisse werden im Kontext der Fragestellung diskutiert.

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NOTIZEN:



**78 Influences of emotional feedback on neural correlates: An ERP Study with Emojis**

Weiß, Martin<sup>1</sup>; Gutzeit, Julian<sup>1</sup>; Rodrigues, Johannes<sup>1</sup>; Mussel, Patrick<sup>2</sup>; Hewig, Johannes<sup>1</sup>

<sup>1</sup>Julius-Maximilians-Universität Würzburg, Deutschland; <sup>2</sup>Freie Universität Berlin, Deutschland

Facial expressions are a relevant aspect of human social interactions. Our faces do not only reveal hints about our emotional state but also about personality and intentions. The information our faces contain affect the social interaction itself and subsequently decisions that result from these interactions. The current digital era, in which people permanently use messaging services that replace face-to-face communication at least partially, has led to an excessive use of emoticons. Therefore, we investigated how emotional feedback in a social bargaining situation with a trading partner influences the individual's neural activity. Instead of photographs of real human beings we used Emojis representing differences in feedback valence. We let 60 participants play an Ultimatum Game in the role of the responder. Following each decision, they got either positive, neutral, or negative feedback from the proposer, dependent on their choice. Furthermore, feedback types were clustered in three identities who had distinct reaction patterns towards acceptance and rejection. Negative feedback evoked the largest P3 amplitudes compared to neutral or positive feedback, which could be explained by a negativity bias or the subjective importance of the outcome. Neutral feedback was processed differently depending on whether it was used as a positive feedback stimulus towards acceptance or as negative feedback towards rejection. Across identities neutral feedback did not differ from each other when it was used towards the same reaction. Taken together, emotional feedback provided by Emojis shows interesting effects on a neural level and should be further examined by future research.

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NOTIZEN:

**79** Does acute stress increase reactive aggression? A combined study using the Trier Social Stress Test (TSST) and a modified Taylor Aggression Paradigm (mTAP)

Konzok, Julian<sup>1</sup>; Propstmeier, Amelie<sup>1</sup>; Henze, Gina-Isabelle<sup>1</sup>; Kärigel, Christian<sup>2</sup>; Weidacker, Kathrin<sup>3</sup>; Schiffer, Boris<sup>2</sup>; Kreuzpointner, Ludwig<sup>1</sup>; Eisenbarth, Hedwig<sup>4</sup>; Wüst, Stefan<sup>5</sup>; Kudielka, Brigitte M.<sup>1</sup>

<sup>1</sup>Department of Medical Psychology, Psychological Diagnostics and Research Methodology, University of Regensburg, Germany; <sup>2</sup>Division of Forensic Psychiatry, Department of Psychiatry, Psychotherapy and Preventive Medicine, LWL-University Hospital Bochum, Germany; <sup>3</sup>University of Cambridge, Department of Psychiatry, Addenbrooke's Hospital, Level E4, Box 189, Cambridge CB2 0QQ, UK.; <sup>4</sup>Department of Psychology, University of Southampton, UK; <sup>5</sup>Institute of Experimental Psychology, University of Regensburg, Germany

The aim of this study was to investigate if acute psychosocial stress enhances reactive aggressive behavior under laboratory conditions.

In this experiment, 30 healthy subjects (16 males) were assigned to one of three TSST conditions, namely the original TSST, a placebo-TSST and a TSST with the fictional opponent of the mTAP being part of the committee (mTSST). Subsequently, subjects completed a mock competitive reaction time task (mTAP) with a fictional opponent, with 40% preprogrammed win and 60% lose-trials. In lose-trials, participants were provoked by taking a low (0-20 cents), medium (30-60 cents) or high (70-90 cents) amount of money (distributed equally and presented randomly) from their funds. Salivary cortisol was collected at seven time points.

Twenty-three cortisol-responders (13 males) were entered into statistical analyses. As expected, cortisol responses to the TSST and mTSST exposure were significantly larger than to the placebo-TSST ( $F(2,20)=7.56, p=.004, \eta^2=.43$ ). Moreover, higher mTAP provocation resulted in significant higher aggression rates ( $F(1,16)=12.96, p=.002, \eta^2=.45$ ). Neither TSST condition, nor sex or cortisol reactivity did significantly predict aggression rates (all  $p>.297$ ). However, we found a trend for an interaction of cortisol AUC<sub>i</sub> and provocation ( $F(1,16)=4.03, p=.062, \eta^2=.20$ ). This was confirmed in a post hoc analysis revealing a significant negative correlation between cortisol AUC<sub>i</sub> and the effect of provocation (differences between aggression rates after high and low provocation) ( $r=-.39, p=.033$ ). The findings suggest that the mTSST is a valid method to induce psychosocial stress. Additionally, there was no indication that acute psychosocial stress enhances reactive aggression. Finally, higher

cortisol reactivity was associated with smaller provocation effects.

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NOTIZEN:

**80** Factors that Influence Social Attention: A Replication

Hildebrandt, Lea; Liskowsky, Martin; Gamer, Matthias

Universität Würzburg, Deutschland

Social attention is the basis for navigating our complex social world. However, how we attend to other people depends on contextual and individual differences. Our aim was to replicate a study by Freeth et al. (2013), investigating how social presence, current task phase, and autistic traits affect social attention. We interviewed participants (n=51) while tracking their fixations on the interviewer. Social presence was manipulated by using live and video interviews consisting of two phases: being asked and answering. We also assessed self-reported autistic traits. We partially replicated the original findings: Social presence influenced fixations, depending on task phase. Specifically, participants fixated the face less when answering in the video condition, but more when being asked live. Contrasting the original results, autistic traits were not correlated with visual exploration. In sum, these findings support the importance of a second-person approach incorporating potential social interactions and the dual function of social gaze.

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NOTIZEN:

**81 Neuronale Netzwerke im Ruhe-EEG sagen Prosoziales Verhalten in einem Public Goods Game vorher**

Schiller, Bastian; Kleinert, Tobias; Heinrichs, Markus

Albert-Ludwigs-Universität Freiburg, Deutschland

Neuronale Netzwerke können im Multikanal-Elektroenzephalogramm (EEG) als kurzzeitige Zeitabschnitte stabiler elektrischer Aktivitätsmuster identifiziert werden. Im entspannten Wachzustand mit geschlossenen Augen finden sich 4 prototypische Netzwerke (A, B, C & D), die gemeinsam etwa 80% der Gesamtvarianz des Signals erklären. Während diese Netzwerke mit bestimmten Funktionen, Psychopathologien, und Persönlichkeitsmustern in Verbindung gebracht wurden, ist bislang wenig zu ihrer Bedeutung für das Sozialverhalten bekannt. In der vorliegenden Studie wurden EEG-Messungen im Ruhezustand bei 57 gesunden Männern durchgeführt, die zu einem zweiten Messtermin an einem interaktiven ökonomischen Entscheidungsspiel teilnahmen. In diesem Spiel sollten sie sich zwischen einem größeren persönlichen Gewinn oder einem kleineren persönlichen, aber größeren kollektiven Gewinn entscheiden (Public Goods Game). Vorläufige Analysen zeigten, dass Personen mit einem höheren Anteil von Netzwerk A (phonologisches Verarbeitungsnetzwerk) und einem geringeren Anteil von Netzwerk D (exekutives Kontrollnetzwerk) im Ruhezustand signifikant altruistischere Entscheidungen trafen. Diese Ergebnisse demonstrieren erstmals eine Verbindung prototypischer elektrischer Aktivitätsmuster im Ruhezustand mit dem Sozialverhalten, und deuten darauf hin, dass Personen mit verstärkter Beteiligung bottom-up gesteuerter neuronaler Prozesse im Ruhezustand altruistischere Verhaltenspräferenzen aufweisen.

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NOTIZEN:

**82 Genetische Variation am GRIN2A-Gen und politische Präferenzen**

Grünhage, Thomas; Reuter, Martin

Institut für Psychologie, Universität Bonn, Deutschland

Substantielle Erblichkeitsschätzer legen kulturübergreifend eine starke genetische Prädisposition politisch-ideologischer Präferenzen nahe. Bisherige Kandidatengen-Untersuchungen zeigten bereits einen möglichen Einfluss von Polymorphismen, die NMDA-Rezeptoren betreffen, auf das Ausmaß liberaler vs. konservativer politischer Einstellungen in den USA. Diesem Ansatz folgend, präsentieren wir vorläufige Evidenz für den Einfluss des Single-Nucleotid-Polymorphismus‘ rs4587976 (G-C) am GRIN2A-Gen auf verschiedene Maße der politischen Orientierung an einer wachsenden deutschen Stichprobe von bisher 166 Pbn: Träger des G-Allels zeigten liberalere Selbsteinschätzungen ihrer politischen Orientierung, geringere Ausprägungen von Right-Wing-Autoritarismus und Sozialer Dominanzorientierung, geringere inhaltliche Übereinstimmungen mit CDU/CSU und AfD sowie höhere inhaltliche Übereinstimmungen mit den Parteien Die Grünen und Die Linke. Zudem gaben sie in der Sonntagsfrage eher eine Wahlintention für Parteien links der Mitte an als homozygote C-Allel-Träger. Die gefundenen Assoziationen hielten größtenteils der statistischen Kontrolle für Alter, Geschlecht und Bildungsgrad stand. Eine Haplotypanalyse unter zusätzlichem Einschluss des rs1366067 führte aufgrund beinahe vollständigen Linkages nicht zur Aufklärung inkrementeller Varianz. Generell gelten Veränderungsresistenz und die Akzeptanz von Ungleichheit als Kernelemente konservativer Ideologie, die in der politischen Psychologie ihrerseits auf Unterschiede in der Verarbeitung von Unsicherheit und Angst zurückgeführt werden. Variationen am GRIN2A-Gen konnten im Tiermodell mit kontextueller Furchtkonditionierung und hippocampaler Langzeitpotenzierung in Verbindung gebracht werden und sind im Humanbereich prädiktiv für die Entwicklung von Alkohol- und Opiatabhängigkeiten. Damit erscheint es plausibel, dass GRIN2A-Polymorphismen über die die Modulation furcht- und angstassoziierter Prozesse politische Einstellungen und politisches Verhalten beeinflussen.

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NOTIZEN:

## 3 Samstag, 02.06.2018

### 3.1 Symposienblock V: 09:00 - 10:30 Uhr

#### 3.1.1 Peripheral biomarkers in burnout and depression: How far are we from clinically useful biomarkers? [Hörsaal A1]

Andreas Walther, Nina Alexander, TU Dresden

Major depressive disorder (MDD), or depression has been declared the leading cause of disability worldwide by the WHO. Along with MDD, burnout, a syndrome defined by work-related exhaustion, depersonalization, and reduced professional efficacy is increasingly discussed as public health concern. However, there is much debate whether the burnout syndrome and MDD represent different pathologies with overlapping symptoms, or if they describe different aspects of the same disorder. Research suggests that development of both - burnout and MDD - is partially caused and maintained by specific underlying pathophysiologies and identifiable biomarkers. Increased inflammation and hyperactivity of the hypothalamic-pituitary-adrenal (HPA) axis are considered the most consistent biological findings in MDD and burnout. Still, reliable identification of individuals affected by either MDD or burnout based on glucocorticoid or inflammatory biomarkers has not been achieved yet. Additional biological systems seem to play important, if not key roles in the pathophysiology of these disorders. Regulatory properties of key genes have been shown to significantly contribute to the development of MDD and burnout. Recent insights related to genetic regulation of the dopamine system as well as a MAO-A polymorphism and their effects on behavioral measures are discussed. Furthermore, data using newly developed technologies for lipidomic quantification coupled with new computational methods using unsupervised data-driven approaches identifying lipid-network biomarkers for MDD and burnout are presented. In this symposium the speakers will provide insight into current advances in the field and discuss the clinical applicability of current biomarkers in MDD and burnout.

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NOTIZEN:

### **Peripheral Glucocorticoid Signaling and Cellular Immune Parameters in Healthy and Depressed Women with and without Childhood Adversity**

Wingenfeld, Katja; Hellmann-Regen, Julian; Otte, Christian

Charité Universitätsmedizin, Deutschland

**Background:** Alterations of the hypothalamic-pituitary-adrenal (HPA) axis, including a reduced sensitivity of glucocorticoid receptors, are a prominent finding in patients with major depressive disorder (MDD). Adverse childhood experiences (ACE) are known to increase the risk to develop MDD.

We aimed to disentangle the effects of ACE and MDD on different aspects of glucocorticoid signaling and unspecific immune responses in peripheral blood cells by comparing healthy women with and without ACE and women with MDD with and without ACE.

**Methods:** We analyzed lymphocytes for their proliferative response to a mitogen and for the attenuating effect of dexamethasone on the latter using a non-radioactive proliferation assay developed for the purpose of capturing small differences in lymphocyte proliferation rates. Additionally, mRNA expression levels of the glucocorticoid and the mineralocorticoid receptor (GR/MR) were determined by quantitative real-time polymerase chain reaction.

**Results:** Our in-vitro analyses revealed significantly increased lymphocyte proliferative responses in subjects with ACE, regardless of MDD. A trend towards reduced GR signaling was seen in subjects with MDD, while there were no changes in GR sensitivity attributable to ACE. MR-GR mRNA levels did not differ between groups.

**Conclusions:** This study provides evidence for a significantly increased immune reactivity in patient-derived cell cultures from subjects with a history of ACE. Our data further support the hypotheses that inflammation might contribute to the pathobiology of MDD.

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NOTIZEN:



**Burnout and reduced immune defence: how can work stress enter the body?**

Penz, Marlene; Miller, Robert; Walther, Andreas; Wekenborg, Magdalena; Kirschbaum, Clemens

TU Dresden, Deutschland

**Background.** A plethora of cross-sectional studies document long-term cortisol alterations as a consequence of chronic stressors. Cortisol is known to have immune suppressive properties and is suggested as one key factor determining the inflammatory cascade after an immune response. Burnout describes a syndrome of chronic work stress exposure that influences mental and physical well-being up to a shortened lifespan.

**Methods.** The Dresden Burnout Study (DBS) is a prospective cohort study examining potential pathways of how work stress elicits its detrimental effects on the body to foster adverse health conditions. The first two years of data collection (baseline T1, autumn/winter 2015, N = 446; follow-up T2, autumn/winter 2016/17, N = 154) provide hair cortisol concentrations (HCC) and white blood cell counts (percent neutrophils, lymphocytes, and monocytes). Likewise, participants completed the Maslach Burnout Inventory General Survey (MBI-GS) and the depression screening instrument PHQ-9.

**Results.** The MBI-GS (subscales emotional exhaustion: EE, reduced efficacy: rE, cynicism: Cy) at T2 (describing 12 months prior assessment) significantly predicted the change in HCC between T1 and T2 ( $\Delta R^2 = 0.07$ ,  $p < 0.01$ ) even after adjusting for the PHQ-9 ( $\Delta R^2 = 0.08$ ,  $p < 0.01$ ). The change in HCC was further negatively correlated to the change in monocytes ( $r = -0.36$ ,  $p = 0.01$ ).

**Conclusion:** The first longitudinal data from the DBS suggests a pathway of HPA axis alterations in burnout sufferers that in turn interacts with peripheral blood leukocytes. The effect was independent of depressive symptoms.

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NOTIZEN:

### **Machine intelligence identifies lipid-network biomarker for depression and burnout**

Walther, Andreas<sup>1</sup>; Cannistraci, Carlo<sup>2</sup>; Duran, Claudio<sup>2</sup>; Penz, Marlene<sup>1</sup>; Gerl, Mathias<sup>3</sup>; Simons, Kai<sup>3</sup>; Wekenborg, Magdalena<sup>1</sup>; Kirschbaum, Clemens<sup>1</sup>

<sup>1</sup>Biological Psychology, TU Dresden, Deutschland; <sup>2</sup>Biomedical Cybernetics, TU Dresden, Deutschland; <sup>3</sup>Lipotype, TU Dresden, Deutschland

**Background:** The lipidome emerges as promising biological system for biomarker research in major depressive disorder (MDD) and burnout. However, quantification and analysis problems have led to inconsistent results with regard to the identification of a lipid-network biomarker for MDD and burnout.

**Methods:** In an observational study design, a population based sample of 168 adults (35.1% male) with a mean age of 42.5 years ranging from 20 to 66 years was examined twice (t1 and t2), where the t2 follow-up measurement was completed one year after baseline examination. Blood samples for lipidomic analysis and hair samples for long-term glucocorticoid analysis were collected. Participants provided information on their MDD and burnout state via self-report measures.

**Results:** The applied machine learning approach revealed distinct lipid-network biomarkers for MDD and burnout. Lipid structures from the phosphatidylcholine (PC), phosphatidylinositol (PI), sphingomyelin (SM), triacylglycerol (TAG), and cholesterol ester (CE) classes were revealed as most discriminative between conditions reaching best AUC and AUPR levels. Several of the identified lipid structures best discriminating between conditions were also related to MDD and burnout symptoms changes from t1 to t2 and also to long-term cumulative glucocorticoid changes from t1 to t2.

**Conclusion:** The identified lipid-network biomarker emerges as useful diagnostic biomarker for MDD and/or burnout. The identified lipid-network biomarker is strongly related to symptom changes and long-term glucocorticoid alterations in MDD and burnout indicating a central role of lipidomic alterations in MDD and burnout. Replication and further establishment of the lipid-network biomarker in longitudinal studies is needed.

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NOTIZEN:

**The influence of the promoter repeat polymorphism MAOA-uVNTR on depression and burnout is moderated by life stress: Evidence from a healthy and an inpatient sample**

Plieger, Thomas; Melchers, Martin; Reuter, Martin

Uni Bonn, Deutschland

The MAOA-uVNTR polymorphism that modulates the expression rate of monoamine oxidase A has already been associated with depression. This strengthens the assumption that especially the serotonergic system plays a crucial role in the pathogenesis of depression. However, studies come to inconsistent results so far. Therefore, a potentially moderating effect of life stress is tested in the present study. A construct closely related to depression is the burnout syndrome of which the molecular genetic basis is widely unknown so far. Therefore, a potential effect of MAOA-uVNTR (in combination with life stress) is also investigated.

N = 1541 subjects were genotyped for the MAOA-uVNTR and filled in the Beck Depression Inventory, the Maslach Burnout Inventory, and a checklist asking for stressful life events (SLE) that had been experienced in the past. Results show a life stress x MAOA-uVNTR interaction effect on burnout and depression in women. As compared to carriers of the less active allele (MAO-L), carriers of the more active allele (MAO-H) show less depression and burnout symptoms when experiencing comparably less SLE whereas they show higher scores than MAO-L carriers when they have experienced more SLE.

The results suggest a less efficient emotion regulation in carriers of the MAO-H allele which should be investigated in future studies. Especially the effect of life stress and MAOA-uVNTR on burnout should be independently replicated in the future as this is the first study showing this association.

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NOTIZEN:

### 3.1.2 States and traits of neural activity and their functional relevance for perception and ageing [Hörsaal A2]

Leonhard Waschke, Universität zu Lübeck

Marieke Scholvinck, Ernst Strungmann Institute for Neuroscience

Moment to moment fluctuations are a key feature of brain activity that manifests regardless of experimental context (e.g. rest, task) and imaging technique (e.g. fMRI, EEG). On the one hand, those variations have been tightly linked to state-like, intra-individual shifts in a number of cognitive as well as perceptual resources and processes. On the other hand, individual patterns of fluctuation have been demonstrated to constitute stable, trait-like inter-personal features that track differences in cognitive function and age.

This symposium will highlight the importance of states and traits of fluctuations in neural activity during sensory processing and ageing. Junior international and national scholars will combine results from a range of imaging techniques and psychophysical models. Specifically, Marieke Scholvinck will present evidence for a link between fluctuations in resting-state BOLD activity and the momentary level of arousal. Niels Kloosterman will concentrate on dynamic states and their influence on the accumulation of sensory evidence and thus perceptual decisions. Leonhard Waschke will address how irregularity in the EEG changes with age and constitutes time-varying, behaviourally relevant brain states by altering information processing. Linda Geerligs will demonstrate how variations in BOLD activity depict age-specific traits and how these are connected to changes in the structural and functional organization of the brain. By combining a wide range of approaches this symposium should not only offer an enclosing view on the current findings, but also facilitate translational discussions.

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NOTIZEN:

**The effect of brain state on spontaneous fMRI activity and behavior**

Scholvinck, Marieke, Ernst Strungmann Institute for Neuroscience, Germany

The vast majority of studies in cognitive neuroscience focus on the brain's response to a stimulus or task. However, the vast majority of the brain's activity is produced spontaneously. Spontaneous brain activity is evident in fMRI as slow signal fluctuations when participants are at rest. These so-called fMRI resting-state fluctuations are currently the topic of intense investigation; however, how they are influenced by, or whether they even reflect, the internal brain state of the participant is largely unknown. Brain state is a fluid concept; it can refer to a continuum of arousal levels ranging from anesthesia through sleep to wakefulness, or it can refer to more cognitive states such as drifting attention and mind wandering. In my talk, I will first present evidence for a direct coupling between fMRI resting-state activity and spontaneous neural activity. I will then show that this coupling is dependent on the level of arousal of the subject. I will end by investigating fluctuations in the cognitive state of attention: how they are reflected in the activity of groups of neurons, and what their consequences are for performance in an attention task.

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NOTIZEN:

### **Selective regulation of neural dynamics underlies cognitive flexibility and adaptability**

Kloosterman, Niels

Max Planck UCL Centre for Computational Psychiatry and Ageing Research, Deutschland

Variability of neural activity is increasingly recognized as a prerequisite for cognitive flexibility and adaptability. The study of aging, for example, has revealed that younger, more variable brains consistently perform better on a host of cognitive tasks, including choosing the optimal behavioral strategy to maximize reward. Open questions, however, are to what extent humans can flexibly tailor their neural dynamics to optimize their behavioral responses, and how age-related changes in neural dynamics affect this ability. Here, I will present research addressing these questions using a modified form of multi-scale entropy (mMSE), an analysis method that quantifies EEG brain signal complexity on various temporal scales. Other lines of research apply traditional spectral EEG power analyses and computational modelling of choice behavior to tackle these issues. Together, this work converges on the idea that those who flexibly modulate neural variability and excitability also optimize behavioral responses across task requirements to maximize reward. Moreover, during aging neural dynamics seem to increasingly shift from internally produced and task-related towards externally induced and stimulus-related, preventing optimal adjustment to relevant specifics of the task at hand. Taken together, these findings shed light on how selective regulation of different aspects of neural variability affects cognitive flexibility and adaptability over the lifespan.

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NOTIZEN:

## Neural irregularity as a comprehensive marker of states and traits in brain activity

Waschke, Leonhard

Universität zu Lübeck, Germany

Sensory representations, and thus human percepts, of the physical world are susceptible to fluctuations in brain state or “neural irregularity”. Furthermore, aging brains display altered levels of neural irregularity. Despite the wide range of measures currently used to dissect continuous activity into temporally distinct states, both assumptions have rarely been linked. I will show that a single, within-trial, information-theoretic measure (weighted permutation entropy) captures neural irregularity in the human electroencephalogram as a proxy for both, trait-like differences between individuals of varying age, and state-like fluctuations that bias perceptual decisions and index selective attention. First, the overall level of neural irregularity increases with participants’ age. Importantly, this process is paralleled by a decrease in moment-to-moment variability of irregularity and hence likely tracks age-related changes at both structural and functional levels of brain activity. Second, in a series of studies, spontaneous states of relatively higher neural irregularity are associated with optimized sensory encoding and improved perceptual sensitivity. The presumed underlying neural mechanism, a dynamic change in the excitability of sensory neural ensembles, also manifests during top-down attention: selective attention reduces neural irregularity over involved sensory regions, most likely reflecting the attentional manipulation of sensory neural gain. Taken together, neural irregularity not only characterizes the fluctuation of behaviorally relevant brain states and tracks attentional gain, but it also identifies trait-like changes that come with age.

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NOTIZEN:

**Processing of naturalistic stimuli in the aging brain: transient as well as trait-like age-related differences**Geerligs, Linda<sup>1</sup>; Cam-CAN,<sup>2</sup>; Campbell, Karen<sup>3</sup>

<sup>1</sup>Donders Institute for Brain, Cognition and Behaviour, Radboud University, Nijmegen, the Netherlands; <sup>2</sup>Cambridge Centre for Ageing and Neuroscience (Cam-CAN), University of Cambridge and MRC Cognition and Brain Sciences Unit, Cambridge, UK, [www.cam-can.com](http://www.cam-can.com); <sup>3</sup>Department of Psychology, Brock University, St. Catharines, Canada

The paradox of neurocognitive aging research is that age is associated with decreased performance on a number of lab-based tasks, while in daily life most healthy older adults are able to function quite well. This raises the question of how age-related declines in processes like attentional control and memory retrieval observed in the lab affect the processing of more naturalistic stimuli, such as movies, which more closely approximate everyday life. We measured fMRI activity while participants (N=577) from the Cambridge Centre for Ageing and Neuroscience ([www.cam-can.com](http://www.cam-can.com)) watched a movie. Watching the same movie induces significant inter-subject synchronization of brain activity across participants - a measure of similarity of information processing. We show that within a number of areas, including the language network, synchrony is preserved with age. However, we observed significant declines in synchrony, mainly in medial prefrontal cortex (mPFC), medial temporal lobe (MTL) and frontoparietal control networks (FPCN). Notably, we found that age-related synchrony differences within the mPFC, MTL and FPCN are highly state dependent, as they vary strongly with events that occur in the movie narrative. Synchrony declines were driven by more idiosyncratic response patterns in older adults and were associated with regionally distinct functional connectivity patterns, as well as declines in white matter integrity, suggesting they may partly reflect more stable, trait-like changes in the aging brain. These findings suggest that while language processing remains intact with age, attentional control and memory deficits observed inside the lab may extrapolate to information processing in everyday life.

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NOTIZEN:



### 3.1.3 Schizotypie und Schizophrenie-Risiko - Implikationen ausgewählter psychologischer und neurobiologischer Korrelate [Hörsaal A3]

Phillip Grant, JLU Gießen, Technische Hochschule Mittelhessen  
Igor Nenadic, Philipps Universität Marburg / UKGM

Das Schizotypiekonzept gilt als das einflussreichste umfassende psychologische Konstrukt in der Schizophrenieforschung. Historisch gesehen wurde angenommen, Schizotypie stelle ein Taxon ausschließlich-krankhafter Persönlichkeitsorganisation dar, deren Bedingung ein oligogenetisches Risiko und deren Extremausprägung die Schizophrenie sei. Obgleich bedeutende Persönlichkeitsmodelle mittlerweile, passend zu rezenten Befunden zur Genetik der Schizophrenie, schizotype Eigenschaften als in der Population normalverteilte Variation gesunder Persönlichkeit ansehen, werden die Konzepte von Schizotypie und Schizophrenierisiko weiterhin häufig als gleichbedeutend angesehen. Tatsächlich legen gegenwärtige Befunde jedoch nahe, dass der Zusammenhang zwischen den genannten Konzepten komplexer ist, sodass das sogenannte volldimensionale Schizotypiemodell Extremausprägungen schizotyper Persönlichkeit lediglich als notwendige, doch nicht mehr als hinreichende Bedingung für die Schizophrenie ansieht. Im Rahmen dieses Symposiums sollen daher sowohl Zusammenhänge als auch Unterschiede zwischen Schizotypie und Schizophrenie(risiko) anhand ausgewählter psychologischer und neurobiologischer Korrelate aufgezeigt werden.

Im Einzelnen werden Befunde zur subjektiven Stressreaktivität, der Kortisolantwort und den Fluktuationen akut-psychosenahen Erlebens beim TSST in Abhängigkeit schizotyper Eigenschaften (Phillip Grant, Gießen), den neurobiologischen Korrelaten schizotyper Eigenschaften und möglichen entsprechenden Netzwerkmodellen mittels MR-Bildgebung (Morphometrie, Spektroskopie und resting state fMRT) (Igor Nenadic, Marburg), der mediiierenden Rolle der Schizotypie bzgl. des Ironieverständnisses und der Bedeutung dessen Defizits bei Schizophrenen anhand einer Metaanalyse von fMRT-Befunden (Alexander Rapp, Tübingen) sowie die Rolle von schizotypen Eigenschaften, Basissymptomen und neurobiologischen Faktoren wie Gendelationen, neurokognitiven Testleistungen oder der mismatch negativity für die Erfassung und Beschreibung von ultra-high risk-Populationen (Frauke Schultze-Lutter, Düsseldorf/Bern) dargestellt und jeweils vor dem Hintergrund des genannten volldimensionalen Schizotypiemodells diskutiert.

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NOTIZEN:

## Stress und akut-psychosenahes Erleben - Die differentielle Rolle schizotyper Persönlichkeitsfacetten auf die Reaktivität im TSST

Grant, Phillip<sup>1,2</sup>; Munk, Aisha Judith Leila<sup>1</sup>; Hennig, Jürgen<sup>1</sup>

<sup>1</sup>Justus-Liebig-Universität Gießen, Deutschland, <sup>2</sup>Technische Hochschule Mittelhessen, Deutschland

Obgleich die Befundlage zum Zusammenhang zwischen stressvollen/traumatischen Erlebensereignissen und einem erhöhten Schizophrenierisiko (sowohl in Bezug auf Erkrankungshäufigkeiten als auch die habituelle Prädisposition zu psychotischem Erleben und Erkranken, die durch das Schizotypiekonstrukt beschreiben wird) grundsätzlich als robust gilt, gibt es diesbezüglich noch zahlreiche offene Fragen. Diese ranken vor allem um die Aspekte der Kausalität des genannten Zusammenhangs sowie der individuellen Beiträge der Facetten der Schizotypie.

Vor allem ist unklar, ob Hochschizotype empfindlicher für Umweltstressoren sind, ob ihre individuelle Persönlichkeit im Sinne einer Erbe-Umwelt-Korrelation die Wahrscheinlichkeit des Erfahrens stressvoller Ereignisse erhöht oder ob womöglich beide Formen der Kausalität eine Rolle spielen. Desweiteren, ob mehr diejenige Facette mit Stresserleben assoziiert ist, die die Neigung zu psychotischem Erleben losgelöst vom Erkrankungsrisiko erklärt (positive Schizotypie), oder diejenigen Facetten, die enger mit dem Krankheitswert bei psychotischer Störung verbunden sind (negative/desorganisierte Schizotypie).

Um zur Beantwortung der Fragen beizutragen, wurden im Rahmen eines standardisierten Laborstressors (Trier Sozialer Stress Test, TSST) an 55 gesunden Studentinnen Unterschiede im subjektiven Stresserleben, in Fluktuationen akut-schizotyper Befindlichkeit und in der Kortisolantwort betrachtet, die durch habituelle Ausprägungen in der Schizotypie erklärt wurden.

Es zeigte sich, dass das subjektive Erleben, insbesondere der empfundene Stress und das akut-positivschizotype Empfinden positiv mit der habituellen Negativschizotypie assoziiert war, wohingegen ein komplexer und differenzierter negativer Zusammenhang zwischen der Kortisolantwort und allen drei Facetten der Schizotypie bestand. Die Ergebnisse und deren Implikation für das Entstehen einer Schizophrenie sollen vor dem Hintergrund der gegenwärtig wohl herrschenden Meinung zum Schizotypiekonstrukt (sog. voll-dimensionales Modell) diskutiert werden.

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NOTIZEN:

**Neurobiologie der Schizotypie: von struktureller MR zu Netzwerkmodellen**

Nenadic, Igor

Philipps Universität Marburg / UKGM, Deutschland

Mittels MR-Bildgebung ist es möglich geworden, neurobiologische Korrelate schizotyper Persönlichkeitszüge nicht nur in klinischen Patientengruppen sondern auch nicht-klinischen Kohorten zu untersuchen. Im vorliegenden Beitrag werden aktuelle MR morphometrische Befunde v.a. bei nicht-klinischen Samples dargestellt, welche Assoziationen schizotyper Merkmale mit medial parietalen (Praecuneus) wie auch lateral präfrontalen corticalen Arealen nahelegen. Weitere aktuelle Befunde mittels MR Spektroskopie sind hinsichtlich der Assoziation zu Schizotypie uneinheitlich, legen aber teils glutamaterge Veränderungen nahe, die mit morphometrischen Parametern korrelieren. Ausgehend von den Befunden zum Praecuneus werden abschließend Netzwerkmodelle für die neurobiologische Grundlage der Schizotypie diskutiert, wie sie mittels (resting state) fMRI in laufenden Studien getestet werden

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NOTIZEN:

**Erklären schizotype Persönlichkeitsmerkmale inter-individuelle Unterschiede im Einschätzen von Ironie und Sarkasmus?**

Rapp, Alexander

Universität Tübingen, Deutschland

Ironieverständnis kommt als Forschungsparadigma insbesondere im Kontext psychischer Erkrankungen vermehrt zur Anwendung. Insbesondere für Schizophrenien und Autismus zeigen inzwischen zahlreiche Studien ein robustes Defizit. Aufgrund der hohen ökologischen Validität und der hohen Häufigkeit von ironischen Bemerkungen in der Alltagssprache wurde zuletzt vermehrt vorgeschlagen, Ironie als Strategie bei sozialem Kompetenztraining einzusetzen. Die Entwicklung von Trainingsprogrammen setzt allerdings ein besseres Verständnis des Ironieverstehens auch bei psychisch gesunden Menschen voraus. Mehrere eigene Datensätze zeigen einen Zusammenhang zwischen Ironieverstehen und schizotypen Persönlichkeitsmerkmalen sowohl in klinischen als auch nicht-klinischen Populationen. Funktionell-kernspintomographische Befunde unterstützen diese Annahme. Das Wissen über die funktionelle Neuroanatomie des Ironieverstehens hat durch fMRT Studien in den letzten Jahren deutlich zugenommen. Eine metaanalytische Analyse der verfügbaren Bildgebungsliteratur wird vorgestellt.

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NOTIZEN:

**Klinische Früherkennung von Psychosen: neurobiologische Korrelate von Basissymptom- und ultra-high risk (UHR) Kriterien**

Schultze-Lutter, Frauke

Heinrich-Heine Universität, Düsseldorf, Deutschland

Neue epidemiologische Untersuchungen zum Einfluss des Alters auf die Prävalenz und klinische Relevanz der derzeit in klinischen Hochrisikokriterien verwandten attenuierten psychotischen Symptomen (APS) sowie kognitiven und perzeptiven Basissymptomen weisen auf differentielle Altersschwellen und damit entwicklungspezifische Faktoren hin. Dabei scheinen APS ab vor einem Alter von 16 Jahren häufiger und klinisch weniger relevant und eher von kognitiven Reifungsprozessen zu sein, während perzeptive und kognitive Basissymptome Altersschwellenwerte von 18 Jahren bzw. in der ersten Mitte der 20er zu haben und damit von Hirnreifungsprozessen beeinflusst scheinen. Dies entspricht ätiologischen Modellen, die APS als Folge inadäquater kompensatorischer Erklärungsmodelle und Basissymptome als direktes psychopathologisches Korrelat von Psychosen zugrundeliegenden neurobiologischen Veränderungen sehen. Erste neurobiologische Studien zu Basissymptomen stützen bereits diese konzeptimmanente Annahme. Diese Befunde sowie UHR- und Basissymptomgruppen vergleichende neurobiologische Studien (strukturelle und funktionelle Bildgebungsstudien, elektrophysiologische Studien sowie auch neurokognitive Studien) sollen dargestellt und vor dem Hintergrund der oben genannten Modellannahmen diskutiert werden.

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NOTIZEN:

### 3.1.4 Advances in Language Electrophysiology: from Auditory Processing to Sentence Comprehension [Hörsaal A4]

Caroline Beese, -Planck Institute for Human Cognitive and Brain Sciences

Lars Meyer, -Planck-Institut für Kognitions- und Neurowissenschaften

Our symposium gives a contemporary and multifaceted view on the domain-specific and domain-general electrophysiological correlates of language—from auditory processing to sentence comprehension: Focusing on the auditory system, Lorenz Fiedler will present cutting-edge results indicating differences in the neural response to attended and unattended speech under varying listening conditions. In the domain of higher-level linguistic processing, Lars Meyer will illustrate the tight relationship between rhythmic electrophysiological activity and language comprehension, arguing that synchronization with speech facilitates the extraction of information. Beyond information extraction, Jona Sassenhagen will reveal neural correlates of word predictability in coherent texts—highlighting the importance of predictive processing when trying to make sense of coherent texts. Tapping into lexical processing, Johanna Rimmele will unravel temporal and spatial neural dynamics underlying hierarchical acoustic and lexical processes important for language comprehension. Finally, the research of Caroline Beese will extend our focus to age differences in the electrophysiological networks underlying language comprehension, showing that domain-general cognitive abilities play a more critical role for intact language processing than previously thought. In sum, our symposium provides a comprehensive update on the wealth of electrophysiological mechanisms that are involved in language processing, as well as current approaches to study these.

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NOTIZEN:

**Selective neural processing of speech under continuously varying listening conditions**

Fiedler, Lorenz; Wöstmann, Malte; Herbst, Sophie K.; Obleser, Jonas

University of Lübeck, Germany

Linear encoding models allow the extraction of the neural response to continuous, non-repetitive stimuli such as speech from electrophysiological recordings. The components of this neural response are taken to reflect consecutive stages of speech processing. Here, we asked how continuously varying listening conditions affect different components of this neural response to attended and ignored speech. To this end, the electroencephalogram of 18 subjects was recorded while they attended to one of two simultaneously presented talkers. The relative intensity (i.e., signal-to-noise ratio; SNR) between the talkers varied stochastically between  $-6$  and  $+6$  dB. Here, I will show that the successive stages of speech processing as extracted from the neural response moved from initially attention-independent encoding of the speech signals to an SNR-invariant, ‘clean’ representation of the attended talker. Under the most adverse SNR, however, the occurrence of an additional parietal source in response to the ignored talker suggests the involvement of non-auditory regions in the inhibition of irrelevant acoustic input. Our findings give insight into the neural implementation of an increasingly selective cascade of speech processing, extending beyond perisylvian cortex.

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NOTIZEN:

## How Neural Oscillations Facilitate Language Comprehension

Meyer, Lars

Max Planck Institute for Human Cognitive and Brain Sciences, Deutschland

Synchronization of neural oscillations with auditory information appears to be critical for auditory speech processing. But oscillations do not only passively track acoustic information; rather, they may also index the active generation of internal linguistic representations that can even override auditory information that is physically present in the stimulus. In my talk, I will present electroencephalography and neurostimulation work that shows endogenous slow-frequency oscillations to phase-lock to internally generated linguistic representations rather than external auditory information. I will also illustrate how such synchronicity may putatively facilitate language comprehension via aligning maxima of electrophysiological excitability to high-level linguistic information. Hence, in addition to the well-known role of exogenous oscillations in auditory processing, endogenous oscillatory activity may serve to optimize the readiness of the brain's language systems to comprehend language.

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NOTIZEN:



**Word by word, neural responses to coherent texts are dominated by predictive processing**

Sassenhagen, Jona; Fiebach, Christian J.

Goethe University Frankfurt, Germany

Experimental studies have provided ample evidence for a sensitivity of the human brain to prediction violations, including on the level of semantics. But is this prominent status of brain responses to surprising events an artefact of experimental paradigms and research programmes, or is language comprehension indeed characterized by predictive processing? We employ a continuous-time distributed-lags regression model to isolate neural consequences of language processing across multiple levels of linguistic representation, successfully recovering electrophysiological correlates of word predictability from continuous-speech experimental data. Then, EEG responses are predicted based on multiple models, including models relying on predictive processing; the simulated brain activity is then compared to measured activity. Comparing encoding quality/simulation-to-brain fit for multiple models, predictive processes consistently rank at the top of the factors most important for the success of this encoding procedure, reliably contributing more explained variance than non-predictive aspects of language. This indicates a key role for predictive processing even beyond carefully constructed contrasts. Continuous-time regression is a promising technique for addressing questions about processing and representation in coherent texts.

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NOTIZEN:

### Lexical and sub-lexical effects on speech segmentation

Rimmele, Johanna M.<sup>1</sup>; Sun, Yue<sup>1</sup>; Michalareas, Georgios<sup>1</sup>; Ghitza, Oded<sup>1,2</sup>; Poeppel, David<sup>1,3</sup>

<sup>1</sup>Department of Neuroscience, Max Planck Institute for Empirical Aesthetics, Frankfurt am Main, Germany; <sup>2</sup>College of Engineering, Boston University; <sup>3</sup>Department of Psychology and Center for Neural Science New York University

Linguistic processing may affect the phase-locking of cortical theta oscillations to speech acoustics, likely due to top-down modulations. Specific temporal dynamics might underlie this hierarchical processing, involving connectivity between frontal and motor areas and auditory cortex in the delta- and theta-bands. Which linguistic levels elicit top-down effects and which mechanisms underlie this reinforcement? Here, we recorded magnetoencephalography in a frequency-tagging paradigm to investigate effects of lexical access and sub-lexical contingencies on the temporal segmentation at the syllabic scale. Two experiments were conducted: Experiment 1, with sequences of German (native) and Turkish (foreign) words, and Experiment 2, with sequences of German and Non-Turkish words (without sub-lexical contingencies). Syllable rate was 4 syllables/sec and word rate was 2 words/sec. Acoustic cues and sub-lexical contingencies for word grouping were removed and controlled between languages. In Experiment 1, we hypothesized spectral peaks in the neural activity at 2 Hz due to lexical access, for German stimuli but not for Turkish stimuli. In Experiment 2, the effect of sub-lexical statistics was measured. In both experiments we expected top-down effects to increase connectivity between putatively higher-order areas and auditory cortex. Our findings provide evidence for lexical segmentation at 2 Hz in frontal and temporal brain areas. Interestingly, participants were sensitive to sub-lexical contingencies even when listening to a non-native language. Sub-lexical contingencies resulted in activation increases in frontal, temporal and motor areas at 2 Hz. The data provide new insights into the temporal dynamics and localization of hierarchical lexical-related processes.

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NOTIZEN:

## Oscillatory Fingerprints of Language Comprehension across the Lifespan

Beese, Caroline

Max Planck Institute for Human Cognitive and Brain Sciences, Deutschland

Recent advances in electrophysiological methodology are currently transforming the neuropsychology of language, but have only been sparsely employed to study the decline of language comprehension across the age trajectory. I present results from two studies examining age differences in the neural substrates underlying successful sentence comprehension, using resting-state (RS) electroencephalography (EEG) and task-related EEG. Employing frequency analysis, beamforming, and functional connectivity analysis, we found decreased RS theta-band power in the left-hemispheric language network to predict comprehension success irrespective of age. On the contrary, alterations of RS theta in a decoupled, domain-general brain network predicted the age-related language comprehension decline. The results emphasize the importance of domain-general cognitive abilities for successful language comprehension in healthy adult aging. Task-related EEG showed lower oscillatory power within alpha band to predict sentence encoding in young adults. This was less pronounced in the middle-aged adults, turning into a power increase in older adults. This neural desynchronization-to-synchronization shift across the lifespan likely reflects a cognitive shift in encoding strategies: At young age, bottom-up encoding may dominate, achieved through cortical disinhibition—allowing enriched information routing throughout the language network. At old age, resource limitations may necessitate an increased reliance on top-down encoding, mirrored in cortical inhibition to avoid information overload. I suggest that declining language comprehension across the lifespan is characterized by changes to the underlying electrophysiological processing networks that are, in turn, associated with changes in the functional dynamics within these networks during task performance.

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NOTIZEN:

### **3.2 Keynote 3: 11:00-12:00 Uhr, Ute Habel: Soziale Kognition als Marker psychischer Störungen [Hörsaal A1]**

Ute Habel

Klinik f. Psychiatrie, Psychotherapie und Psychosomatik, Uniklinik RWTH Aachen, Deutschland

Sozial-emotionale Prozesse spielen eine wesentliche Rolle für soziale Interaktionen und sind ein charakteristisches Merkmal psychischer Störungen. Messungen sozialer Kognition können als Endophänotypen im klinischen Kontext dazu verwendet werden, Psychopathologie und Vulnerabilität für psychische Störungen transdiagnostisch zu definieren. Die Verarbeitung von Gesichtern ist sicher einer der am besten untersuchten Aspekte sozialer Kognition sowohl bei Gesunden als auch bei Patienten mit psychischen Störungen. Bildgebende Studien zur Gesichtsverarbeitung und Empathie werden vorgestellt, bei denen unterschiedliche Einflussfaktoren untersucht wurden, darunter Kontext oder soziale Chemosignale. Während im Falle von Gesichtsverarbeitung und Empathie vor allem passive Prozesse erfasst werden, sind es im Falle von aggressivem Verhalten eher aktive bzw. reaktive Prozesse. Aggressives und impulsives Verhalten sind ein häufiges Symptom psychischer Erkrankungen und klinisch bedeutsam. Dabei ist Aggression auf einem Kontinuum der normalen emotionalen Reaktion bis hin zu einer übersteigerten fehlangepassten Form zu verstehen, wobei biologische, genetische und psychische Faktoren zur Entstehung pathologisch aggressiven Verhaltens beitragen. Auf vermeintliche Provokationen anderer werden Ärger und aggressives Verhalten über verschiedene Verhaltensmasse untersucht. Es kommen experimentell verschiedene Paradigmen zur Aggressionsinduktion während bildgebender Messungen zum Einsatz, um Interaktionen zwischen relevanten Einflussfaktoren aggressiven Verhaltens zu ermitteln. Es zeigten sich sowohl im Verhaltensbereich als auch in den neuronalen Korrelaten, dass subjektiv Ärger und das Aggressionsnetzwerk erfolgreich stimuliert werden können und Wechselwirkungen zwischen hormonellen und genetischen Faktoren auftreten. Im klinischen Bereich werden Daten von Patienten mit psychischen Störungen vorgestellt.

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NOTIZEN:

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NOTIZEN:

### 3.3 Symposienblock VI: 12:15-13:45

#### 3.3.1 Cue-reactivity als Merkmal von Verhaltenssüchten: Moderatoren und biologische Mechanismen [Hörsaal A1]

Jana Strahler, Rudolf Stark, Justus-Liebig-Universität Gießen

Verhaltenssucht beschreibt exzessiv und unkontrolliert ausgeführte belohnende Verhaltensweisen, die Merkmale einer Abhängigkeit aufweisen. So sind ungezügelter Kaufverhalten oder Glücksspielen verhältnismäßig alte Phänomene, die auch im psychiatrischen Kontext schon früh dokumentiert wurden. Eher neue Phänomene betreffen die exzessive Nutzung des Internets, wobei die häufigsten Formen dabei die suchtartige Nutzung von Online-Spielen, sozialen Netzwerken, Interneteinkaufsportalen und Internetpornografie darstellen. Eine erhöhte Reizreaktivität (cue reactivity) im Sinne einer verstärkten Reaktionsbereitschaft auf Stimuli, die das belohnende Verhalten ankündigen, wird dabei als wesentliches Merkmal der Entstehung und der Aufrechterhaltung von Verhaltenssüchten angenommen. Ziel des Symposiums ist es, behaviorale und (neuro-) physiologische Reaktion bei der Verarbeitung von belohnungsrelevanten Reizen bei sowohl Gesunden als auch Personen mit pathologischem Gebrauch nachzuzeichnen. Das Symposium wird dabei ein breites methodisches und inhaltliches Netz spannen.

Der erste Beitrag (Kräplin, Dresden) hat zum Ziel, den Einfluss des Spielens am Glücksspielautomaten im Labor bei glücksspielerfahrenen Teilnehmern auf die Herzratenvariabilität zu untersuchen. Beitrag zwei (Müller, Hannover) untersucht in u.a. einem Cue-Reactivity Paradigma Patient/innen mit pathologischem Kaufen und gesunde Kontrollen. Der dritte Beitrag (Antons, Duisburg-Essen) beschäftigt sich mit der Responsivität auf pornografische Reize in Interaktion mit kognitiven und emotionalen Prozessen bei Internetpornografiesucht. Mittels funktioneller magnetresonanztomographischer Bildgebung wird im vierten Beitrag (Klein, Gießen) schließlich der Einfluss akuten Stresses auf die neuronale Verarbeitung pornografischer Reize bei Männern mit unterschiedlichem Ausmaß habituellen Pornografiekonsums untersucht.

Die Beiträge zeigen, dass suchtbezogene belohnungsanzeigende Hinweisreize ausgeprägte affektive, kognitive und (neuro-) physiologische Reaktionen bedingen. Konsequenzen für den Verlauf des Suchtprozesses sowie die diagnostische Einordnung von Verhaltenssüchten werden zum Abschluss des Symposiums diskutiert.

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NOTIZEN:

### **Cue-Reaktivität beim Glücksspielen im Labor: Eine Pilotstudie**

Kräplin, Anja; Zaunseder, Sebastian

Technische Universität Dresden, Deutschland

Um die ätiologische Forschung zur Störung durch Glücksspielen voranzubringen, ist es notwendig, Glücksspielverhalten möglichst kontrolliert und dennoch ökologisch valide zu erfassen. Als ein vielversprechendes Untersuchungsparadigma wurde in einer Pilotstudie geprüft, ob Glücksspielen unter Laborbedingungen physiologische Cue-Reaktivität auslöst.

Es wurden 15 regelmäßige Glücksspieler (Alter 24 bis 69, darunter n=7 Frauen) in Spielhallen rekrutiert. Ihr Spielverhalten wurde an einem Glücksspielautomaten im Labor untersucht. Während des Spielens wurde die Herzratenvariabilität (HRV) als Indikator für Cue-Reaktivität erfasst.

Das Glücksspielen erhöhte signifikant die HRV-Parameter. Die Höhe der Glücksspieleinsätze war dabei signifikant positiv mit der Leistung in den nieder- und hochfrequenten Bändern (LF und HF) des HRV-Spektrums während und nach dem Glücksspielen assoziiert.

Somit zeigte sich Evidenz dafür, dass Spielen an einem Glücksspielautomaten im Labor bei glücksspielerfahrenen Teilnehmern Cue-Reaktivität auslöst, besonders während und nach hohen Spieleinsätzen. Glücksspiele im Labor könnten somit ökologisch valide Paradigmen in der ätiologischen Forschung zur Störung durch Glücksspielen darstellen.

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NOTIZEN:

### **Cue-Reactivity und Implizite Assoziationen bei Pathologischem Kaufen**

Müller, Astrid<sup>1</sup>; Vogel, Birte<sup>1</sup>; Trotzke, Patrick<sup>2</sup>; Löber, Sabine<sup>3</sup>; Brand, Matthias<sup>2</sup>; De Zwaan, Martina<sup>1</sup>

<sup>1</sup>Klinik für Psychosomatik und Psychotherapie, Medizinische Hochschule Hannover, Deutschland; <sup>2</sup>Allgemeine Psychologie: Kognition, Universität Duisburg-Essen, Deutschland; <sup>3</sup>Department für Klinische Psychologie, Universität Bamberg, Deutschland

Hintergrund: Pathologisches Kaufen (PK) wird aktuell als eine Verhaltenssucht betrachtet, weil es Ähnlichkeiten mit substanzgebundenen Abhängigkeiten hinsichtlich zugrundeliegender Mechanismen aufzuweisen scheint. Ziel: Die Studie untersuchte, ob Craving-Reaktionen auf Kaufbilder sowie implizite Assoziationen bei der Präsentation von Kaufbildern mit pathologischem Kaufen zusammenhängen. Methodik: An der Studie nahmen 41 therapieaufsuchende Patienten mit PK und 41 nicht-klinische Kontrollpersonen teil. Zur Induktion von Cue-Reaktivität wurde ein Paradigma der Bildbewertung (Kaufstimuli vs. neutrale Stimuli) verwendet. Zudem wurde ein bipolarer Impliziter Assoziationstest (IAT mit positiven und negativen Begriffen) mit den vorab semi-individualisierten Kaufbildern vs. Joggingbildern bearbeitet. Ergebnisse: Die Patienten zeigten ein stärkeres subjektives Craving und eine größere Cue-Reaktivität (mehr Arousal, Valenz und Kaufverlangen) auf Kaufstimuli als die Kontrollgruppe. Wider Erwarten unterschied sich die Patientengruppe nicht von der Kontrollgruppe hinsichtlich impliziter Assoziationen zwischen Kaufbildern und positiven/negativen Begriffen. Schlussfolgerung: Die Ergebnisse früherer Studien zu Cue-Reaktivität bei Kaufsucht konnten repliziert werden. Allerdings konnte kein kognitiver Bias in Bezug auf Kaufstimuli bei Patienten mit PK nachgewiesen werden. Die Ergebnisse der Studie und deren Implikationen für zukünftige Untersuchungen werden diskutiert.

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NOTIZEN:



## **Internetpornografiesucht: Die Rolle von kognitiven und emotiven Prozessen in der Suchtentwicklung**

Antons, Stephanie<sup>1,2</sup>; Brand, Matthias<sup>1,2</sup>

<sup>1</sup>Allgemeine Psychologie: Kognition und Center for Behavioral Addiction Research (CeBAR), Universität Duisburg-Essen; <sup>2</sup>Erwin L. Hahn Institute for Magnetic Resonance Imaging

Eine spezifische Form der Internetnutzungsstörung ist die süchtige Nutzung von Internetpornografie. Dual-Prozessmodelle aus der Suchtforschung gehen davon aus, dass ein Ungleichgewicht zwischen dem sogenannten reflexiven und dem impulsiven System die Aufrechterhaltung des exzessiven Verhaltens trotz des Erlebens negativer Konsequenzen begünstigt. Daran anknüpfend geht die Incentive-Sensitization Theory von einer Hypersensitivierung des dopaminergen Belohnungssystems und damit verbundener Reizreaktivität sowie Cravingreaktionen als Ursache für den Kontrollverlust über das Nutzungsverhalten aus. Auch im Kontext der Internetpornografiesucht geht man von einer Hyperaktivität des impulsiven Systems aus, welches das reflektive System überschreibt und somit zum Kontrollverlust über die Pornografienutzung führt.

Es werden Studien vorgestellt, die die Rolle der Interaktion von Impulsivität, Craving und kognitiven Kontrollfunktionen bei der Entstehung und Aufrechterhaltung einer Internetpornografiesucht adressieren. Ebenso werden Ergebnisse einer bildgebenden Studie beschrieben, die erste Hinweise auf eine Hypersensitivierung des dopaminergen Belohnungssystems liefert.

Die Ergebnisse sprechen dafür, dass es im Verlauf des Suchtprozesses zu einer erhöhten Reizreaktivität und Hyperaktivierung des ventralen Striatums kommt, die sodann mit einer geminderten Kontroll- und Steuerungsfunktion interagiert. Außerdem kann gezeigt werden, dass sich ein funktionales Kontrollsystem, welches sich zum Beispiel durch funktionale Copingstrategien auszeichnet, protektiv auf die Entwicklung und Aufrechterhaltung einer Internetpornografiesucht auswirkt.

Die aktuellen Studien weisen darauf hin, dass eine erhöhte Responsivität auf pornografische Reize in Interaktion mit kognitiven und emotiven Prozessen die Aufrechterhaltung einer Internetpornografiesucht erklären.

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NOTIZEN:

## **Der Einfluss von Stress auf die Verarbeitung visueller sexueller Stimuli (VSS) bei Männern**

Klein, Sanja; Strahler, Jana; Kruse, Onno; Stark, Rudolf

Justus-Liebig-Universität Gießen, Deutschland

Hypersexuelle Verhaltensweisen, wie z.B. exzessiver Pornografiekonsum, können im Sinne einer Verhaltenssucht aufgefasst werden. Aus der Forschung zu stoffgebundenen Abhängigkeiten lässt sich ein Zusammenhang zwischen Stress und vermehrt süchtigen Verhaltensweisen ebenso wie Rückfällen erwarten. In diesem aktuell laufenden Projekt wird der Einfluss von Stress und individueller Konsumintensität auf die neuronale Verarbeitung visueller sexueller Stimuli (VSS) mit einer Variation des Monetary Incentive Delay Paradigmas untersucht.

Versuchspersonen (nur Männer) mit unterschiedlichen VSS-Konsumintensitäten unterziehen sich entweder einem psychosozialen Stresstest oder einer Kontrollbedingung ohne Stressinduktion. Direkt im Anschluss folgt die Erfassung der neuronalen Verarbeitung wechselnder VSS-Antizipations- und VSS-Konsum-Phasen (Sexual Incentive Delay) mittels funktioneller Magnetresonanztomografie. Neben fMRT-Daten werden humorale, morphometrische, psycho-physiologische, behaviorale und subjektive Daten sowie Daten zur funktionellen und strukturellen Konnektivität erhoben.

Eine Zwischenanalyse (n=24 Stress, n=33 Nicht-Stress) ergab eine erhöhte Hirnaktivierung bei VSS während der Antizipations- und Konsumphase im Vergleich zu Kontrollstimuli. Dabei ergaben sich unterschiedliche Aktivierungsmuster in den Strukturen des Belohnungssystems bei VSS-Antizipation versus VSS-Konsum. Allerdings zeigte sich in keiner der beiden Phasen ein Einfluss von Stress auf die neuronale Verarbeitung von VSS.

Es sollen die neuesten Mediator- und Moderatoranalysen bezogen auf den Einfluss von Stress und VSS-Konsumintensität auf die neuronale VSS-Verarbeitung präsentiert werden. Daraus ableitend werden kritische Faktoren bei der Entwicklung von exzessivem Konsumverhalten und Kontrollverlust mit Bezug auf VSS diskutiert.

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NOTIZEN:

### 3.3.2 Biopsychologische Mechanismen der körpereigenen Schmerz-inhibition [Hörsaal A2]

Miriam Kunz, Universitaet Groningen

Der menschliche Organismus verfügt über ein körpereigenes Schmerzhemmsystem, welches nicht nur akute Schmerzempfindungen inhibieren hilft, sondern auch eine zentrale, präventive Rolle in Prozessen der Schmerzchronifizierung spielt. Dieses körpereigene Schmerzhemmsystem lässt sich mittlerweile sehr gut psychophysiologisch untersuchen. So lässt sich mit dem sogenannten Conditioned Pain Modulation (CPM)-Paradigma Schmerz-inhibitionsmechanismen abbilden, die dem Phänomen „Schmerz unterdrückt Schmerz“ zugrunde liegen. Hierzu werden zwei Schmerzreize gleichzeitig an unterschiedlichen Körperstellen appliziert, wobei einer der Schmerzreize langanhaltend und intensiver ist (konditionierende Stimulus) und der andere Schmerzreiz in der Regel kürzer und schwächer ist (Teststimulus). Der langanhaltende, intensivere Schmerzreiz führt zu einer anatomisch generalisierten Schmerz-inhibition an anderen Körperstellen und somit zu einer Inhibition des kürzeren, schwächeren Schmerzreizes. Die Stärke des CPM Effektes gibt Hinweis auf die Güte der körpereigenen Schmerz-inhibition einer Person. Hierbei liegen dem CPM Effekt eine Vielzahl von Mechanismen zugrunde, die unter einer biopsychologischen Perspektive am besten verstanden werden können. Ziel dieses Symposiums ist es, die wichtigsten biopsychologischen Mechanismen aufzuzeigen, welche die Stärke des CPM-Schmerz-inhibition maßgeblich beeinflussen. Eine zentrale Einflussgröße ist der Schlaf, der im ersten Beitrag Thema sein wird. Im zweiten Beitrag soll die Rolle sportlicher Aktivität auf die körpereigene Schmerz-inhibition besprochen werden. Ob Alkohol die körpereigene Schmerz-inhibition stärkt oder schwächt wird im dritten Vortrag beleuchtet. Im letzten Beitrag werden Befunde zu Alterseinflüssen auf die CPM-Schmerz-inhibition dargestellt.

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NOTIZEN:

**Einfluss des Schlafes auf die körpereigene Schmerz inhibition**

Lautenbacher, Stefan; Strömel, Cindy

Universität Bamberg, Deutschland

Schlafdeprivation führt zur Hyperalgesie und Schlafstörungen lösen klinische Schmerzbeschwerden aus. Auf welchem Weg beeinflusst der gestörte Schlaf den Schmerz? Es gibt erste Hinweise, dass ein wichtiger Angriffspunkt das körpereigene Schmerzhemmsystem ist. Studien mit experimenteller Schlafdeprivation oder mit Patienten mit Schlafstörungen weisen auf Defizite der CPM- Schmerz inhibition hin, sobald Schlaf ausreichend stark fragmentiert wird. Offenbar muss die Veränderung des Schlafes jedoch experimentell substantiell oder pathologisch sein, weil eine eigene Studie an gesunden Personen ohne Schlafstörungen keine Zusammenhänge zwischen Schlafcharakteristika und CPM-Schmerz inhibition nachweisen ließ. Eine weitere offene Frage ist, welche Schlafanteile für die nächtliche Restauration des körpereigenen Schmerzhemmsystems notwendig sind, also nicht gestört werden dürfen. Die vermutete besondere Relevanz von SWS- und REM-Schlaf ist noch nicht ausreichend bewiesen.

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NOTIZEN:

## **Einfluss von Sport auf die körpereigene Schmerz-inhibition**

Carl, Maria

Friedrich-Schiller-Universität Jena, Deutschland

Bei der Erforschung der Auswirkung von Sport auf die Schmerzwahrnehmung werden zwei Hauptrichtungen unterschieden: zum Einen die akuten Auswirkungen einer einzelnen Ausdauersportbelastung auf die Schmerzwahrnehmung (erhöhte Schmerzschwellen direkt nach der sportlichen Betätigung „exercise-induced hypoalgesia“), zum Anderen die Auswirkung von regelmäßig, intensiv betriebenen Ausdauersporttraining auf die Schmerzwahrnehmung (Ausdauersportler haben höhere Schmerztoleranzschwellen als Nichtsportler).

Erste Studien zur CPM-Schmerz-inhibition lassen vermuten, dass Ausdauerathleten durch langjähriges intensiv betriebenes Training ein effizienteres körpereigenes Schmerz-hemmsystem entwickeln. In einer aktuellen Studie wollten wir erstmalig die neuronalen Wirkmechanismen der körpereigenen Schmerz-hemmung bei Ausdauerathleten genauer betrachten. Dazu führten wir ein etabliertes Placeboparadigma im MRT und ein klassisches CPM-Paradigma (außerhalb des MRTs) an trainierten Ausdauersportlern und Nichtsportlern durch. Wie erwartet, zeigte sich eine größere CPM-Schmerz-inhibition bei Ausdauerathleten im Vergleich zu Nichtsportlern sowie eine positive Korrelation der Größe der CPM-Schmerz-inhibition mit der Ausdauerleistungsfähigkeit. Interessanterweise zeigten Ausdauersportler aber keinen größeren Placeboeffekt als Nichtsportler, jedoch veränderte Aktivierungen in der Neuromatrix des Schmerzes bei schmerzhafter Stimulation. Die Ergebnisse sollen unter Betrachtung von psychologischen Einflussvariablen und im Hinblick auf den unterschiedlichen zugrundeliegenden Mechanismen von körpereigener Schmerzreduktion durch Placebo versus CPM diskutiert werden.

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NOTIZEN:

### **Wirkung von Alkohol auf die körpereigene Schmerzinhibition**

Horn-Hofmann, Claudia<sup>1</sup>; Capito, Eva<sup>1</sup>; Wolstein, Jörg<sup>2</sup>; Lautenbacher, Stefan<sup>1</sup>

<sup>1</sup>Physiologische Psychologie, Universität Bamberg, Deutschland; <sup>2</sup>Pathopsychologie, Universität Bamberg, Deutschland

Schmerzdämpfende Effekte von Alkohol werden seit Jahrhunderten beschrieben; damit übereinstimmend zeigen epidemiologische Studien einen Zusammenhang zwischen chronischem Schmerz und erhöhtem Alkoholkonsum. Experimentelle Studien zur akuten Wirkung von Alkohol auf die Schmerzwahrnehmung bei Menschen sind jedoch selten und beschränkten sich bisher auf statische Schmerzmaße (Schmerzschwelle, Toleranzschwelle, Schmerzratings). Alkoholeffekte auf die CPM-Schmerzinhibition wurden bisher noch nicht untersucht, erscheinen jedoch angesichts der Wirkung von Alkohol auf das Serotonin- und Opioidsystem plausibel. Möglicherweise könnte eine Verstärkung der endogenen Schmerzhemmung durch Alkohol Schmerzpatienten zur Selbstmedikation motivieren. In einer aktuellen Studie untersuchten wir die Wirkung von zwei moderaten Alkoholdosen (Zielkonzentrationen 0,6‰ bzw. 0,8‰) auf CPM bei 39 gesunden Personen in einem Placebo-kontrollierten Within Subject Design. In jeder der drei Sitzungen wurde ein CPM-Paradigma jeweils vor und nach der Getränkegabe durchgeführt. Wir konnten eine Verstärkung der CPM-Hemmung durch Alkohol zeigen; interessanterweise war diese ausgeprägter für die niedrige Dosis. Anschließend an die Diskussion dieser Befunde soll ein Ausblick auf die geplante Fortsetzung des Projekts mit chronischen Schmerzpatienten gegeben werden.

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NOTIZEN:

### **Alterseinflüsse auf die körpereigene Schmerz inhibition**

Kunz, Miriam

Universitaet Groningen, Niederlande

Obwohl es bislang nur wenige Untersuchungen zur Veränderung der CPM-Schmerz inhibition mit dem Alter gibt, erlauben diese jedoch alle dieselbe Schlussfolgerung. Diese Form der endogenen Schmerz hemmung funktioniert bei alten Menschen nicht nur deutlich schlechter, es kann sogar passieren, dass sich zwei Schmerzreize nicht mehr wechselseitig sensorisch-perzeptiv hemmen, sondern sogar verstärken. Das hieße, die Schmerz inhibition schlägt in eine Schmerz fazilitation mit dem Alter um. Diese Veränderungen zeigen sich bereits im mittleren Lebensalter, also zu Zeiten, in denen die Prävalenz des chronischen Schmerzes erste Gipfel erreicht. In einer aktuellen Studie sind wir der Frage nachgegangen, ob diese altersassoziierten Veränderungen in der CPM-Schmerz inhibition mit neuropsychologischen Leistungseinbußen und/oder mit strukturellen Gehirnveränderungen assoziiert sind. In einer Stichprobe von 50 älteren Personen konnten wir zeigen, dass die Abnahme der CPM-Schmerz inhibition insbesondere mit Leistungseinbußen in den exekutiven Funktionen korreliert war. Zudem zeigte sich ein Zusammenhang zwischen Abnahme der grauen Substanz in fronto-striatalen Arealen und Defiziten in der körpereigenen Schmerz inhibition. Diese Befunde sollen vorgestellt und diskutiert werden

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NOTIZEN:

### 3.3.3 Biopsychological evidence for the primacy of social information processing [Hörsaal A3]

Carolin Moessnang, Zentralinstitut für Seelische Gesundheit  
Katrín Preckel, Max-Planck-Institut für Kognitions- und Neurowissenschaften

The human brain is highly tuned to the processing of social information. In fact, social stimuli capture our attention with unprecedented ease and we are able to process complex social information already at very young age. In this symposium, we present a series of studies that explore this phenomenon and its biological correlates from different conceptual and methodological perspectives. Using eye-tracking, Aleya Flechsenhar demonstrates that we direct our attention not only reflexively, but also voluntarily to social stimuli, and that this social bias remains unaffected by task difficulty. Lara Rösler combined eye-tracking with functional magnetic resonance imaging (fMRI) to study reflexive social attention. Her findings show that initial saccades preferentially occur in the direction of social stimuli and that these effects relate to early visual cortex activity. Katrin Preckel used an adapted face-matching fMRI paradigm to disentangle social and emotional components of implicit face processing, and demonstrates a specific habituation of the amygdala to negative as opposed to neutral faces. Carolin Moessnang adopts a developmental approach and shows that neurofunctional correlates of reflexive (i.e. spontaneous) mentalizing are robustly developed by the age of 6, while protracted changes occur in the fine-tuning of network interactions from childhood to adulthood. Finally, Anja Kaßbecker presents evidence of moral reasoning in 3-year-old children, which substantiates the claim that humans are experts for social information already at very young age. Overall, this selective collection of studies shows that different strains of research converge on unraveling the biopsychological correlates of the primacy of social information processing

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NOTIZEN:



## Investigating Top-Down Mechanisms of Social Attention

Flechtenhar, Aleya<sup>1</sup>; Rösler, Lara<sup>2</sup>; Gamer, Matthias<sup>3</sup>

<sup>1</sup>Universität Würzburg, Deutschland; <sup>2</sup>Universität Würzburg, Deutschland;

<sup>3</sup>Universität Würzburg, Deutschland

Research on social attention has recently revealed that a selection of social features occurs reflexively. The question remains whether it is also selected voluntarily and continuously in the presence of increasing top-down demands. Therefore, we conducted a study in which we investigated the influence of different tasks on the selection of social features (i.e. depicted human being) in complex naturalistic scenes. Results depicted a consistent social bias independent of task difficulty. To isolate top-down attention, we subsequently established a gaze-contingent viewing paradigm, in which the visual field is constrained and updated in response to the viewer's eye movements, thereby masking contextual information. Herein, we analyzed viewing dynamics between natural and gaze-contingent conditions. These differed significantly between displays, but also with regard to social context: temporal and spatial dynamics of viewing behavior were altered for gaze-contingent displays and recurrent fixations were more frequent and closer together in time for social as compared to non-social scenes. In both studies, physical saliency, as determined by the Graph-Based Visual Saliency algorithm, did not account for the preferential selection of social features. Collectively, these experiments imply a voluntary selection of social features, which defy top-down demands, contributing to an understanding of the mechanisms of social attention.

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NOTIZEN:

**Behavioral and neural mechanisms of reflexive social attention**

Rösler, Lara; Gamer, Matthias

Universität Würzburg, Deutschland

Numerous eye-tracking studies have shown that we prioritize social information (e.g. human heads or bodies) when freely observing a complex naturalistic scene. While social attention is known to occur independently from the physical saliency of competing scene elements, it remains unresolved whether it takes place reflexively or voluntarily. To investigate the early stages of social attention, we presented naturalistic scenes with and without social features for 200 ms while participants' eye movements were recorded. We observed significantly more initial eye movements to areas containing social features than a chance level distribution of saccades would suggest. Additionally, a generalized mixed model analysis revealed that social information better predicted saccade direction than physical saliency. In a follow-up experiment, we used a combination of eye-tracking and functional magnetic resonance imaging to investigate which neural mechanisms facilitate this rapid allocation of social attention. A potential candidate region is the amygdala which might modulate local activity in early visual cortex and thereby facilitate saccade preparation or execution towards social features. Activity changes in early visual cortex reflected the localization of social features and were modulated by the occurrence of saccades. On the level of univariate analyses, however, we did not observe significant amygdala activation but it is possible that localization of social features in the visual field or the elicitation of saccades are rather represented in multivariate patterns of amygdala activity. Collectively, our results support the notion of a reflexive component of social attention which is mirrored in early visual cortex activity.

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NOTIZEN:

### Matching affective faces and scenes: an fMRI study

Preckel, Katrin<sup>1</sup>; Trautwein, Fynn-Mathis<sup>2</sup>; Paulus, Frieder M.<sup>3</sup>; Krach, Sören<sup>3</sup>; Singer, Tania<sup>1</sup>; Kanske, Philipp<sup>1,4</sup>

<sup>1</sup>Max Planck Institute for Human Cognitive and Brain Sciences, Leipzig; <sup>2</sup>Edmond J. Safra Brain Research Center for the Study of Learning Disabilities, University of Haifa, Israel; <sup>3</sup>Department of Psychiatry and Psychotherapy, Social Neuroscience Lab, Lübeck University, Center of Brain Behavior and Metabolism (CBBM), Luebeck; <sup>4</sup>Institute of Clinical Psychology and Psychotherapy, Department of Psychology, Technische Universität Dresden, Dresden

The emotional matching paradigm by Hariri and colleagues is a widely used experiment that reliably activates the amygdala. However, this experiment only includes negative faces and negative scenes which are compared to geometric shapes instead of neutral stimuli of the same category (faces or scenes). Therefore, it is unclear if the amygdala activation can indeed be attributed to emotional valence of the stimuli or another feature like their social content. In order to validate and improve this paradigm, we conducted a functional magnetic resonance imaging study ( $N = 27$ ) in which additional stimuli were included. We added emotionally neutral and positive stimuli for each social category (faces, social and non-social scenes, the latter do not contain human or animal content). The additional categories enable us to differentiate the observed effects in the amygdala in more detail than the original paradigm. The complementary contrasts of the original paradigm could be replicated and elicited amygdala activation. Furthermore, a specific habituation effect for negative faces was observed in the amygdala. Moreover, positive stimuli elicited activation in the anterior cingulate cortex and the insula, but not in the ventral striatum. Taken together, the validated adaption study enables us to make more precise statements on emotional processing, specifically in the amygdala. These advances may benefit future clinical or intervention studies on identifying selective impairments and improvements in emotional and social stimuli processing.

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NOTIZEN:

## Social brain responses to spontaneous mentalizing in typical and atypical development

Moessnang, Carolin<sup>1</sup>; Braun, Urs<sup>1</sup>; Baumeister, Sarah<sup>1</sup>; Frouin, Vincent<sup>2</sup>; Baron-Cohen, Simon<sup>3</sup>; Durston, Sarah<sup>4</sup>; Persico, Antonio<sup>5,6</sup>; Spooren, Will<sup>7</sup>; Murphy, Declan<sup>8</sup>; Loth, Eva<sup>8</sup>; Buitelaar, Jan<sup>9</sup>; Banaschewski, Tobias<sup>1</sup>; Brandeis, Daniel<sup>1</sup>; Tost, Heike<sup>1</sup>; Meyer-Lindenberg, Andreas<sup>1</sup>

<sup>1</sup>Central Institute of Mental Health, Mannheim, Germany; <sup>2</sup>Neurospin Centre CEA, Paris, France; <sup>3</sup>University of Cambridge, United Kingdom; <sup>4</sup>University Medical Center Utrecht, The Netherlands; <sup>5</sup>University of Messina, Italy; <sup>6</sup>University Campus Bio-Medico, Rome, Italy; <sup>7</sup>Roche Innovation Center, Basel, Switzerland; <sup>8</sup>King's College London, United Kingdom; <sup>9</sup>Radboud University Nijmegen Medical Centre, The Netherlands

Animated agents (e.g., cartoons) elicit spontaneous mentalizing, which has been shown to be impaired in individuals with autism spectrum disorder (ASD). Here, we aimed at characterizing the neurofunctional correlates of spontaneous mentalizing from childhood to adulthood in 224 typically developing (TD) individuals and 264 individuals with ASD aged 6 to 30 years. Functional data was analyzed in three complementary ways, including 1) the analysis of stimulus-locked changes in signal strength (i.e., activation), 2) the analysis of stimulus-locked and stimulus-independent synchronization between brain regions (i.e., connectivity), and 3) the application of network modeling approaches to assess system segregation, a putative marker of network maturation. We observed robust effects of task, but no clear-cut effects of age and diagnosis on stimulus-locked responses of the social brain. Age was inversely correlated with stimulus-locked activation in the executive control network. Similarly, no effects of age and diagnosis were observed for stimulus-independent synchronization of single social brain regions. However, their collective behavior as assessed by network modeling revealed a general increase of segregation of the social brain system with increasing age during active mentalizing. In addition, we observed a specific reduction of social brain system segregation from the default mode network in ASD. Collectively, these results suggest that task-locked responses of the social brain to spontaneous mentalizing are well developed by the age of 6 in both TD and ASD subjects. Complex network interactions, in contrast, show continuing maturation of the social brain and suggest a specific loss of functional compartmentalization in ASD.

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NOTIZEN:

### **The Moral Roots of Fairness: Young Children's Enforcement of Fairness Norms Is Related to Their Prosocial Behavior**

Kassecker, Anja; Schmidt, Marco F.H.

Ludwig-Maximilians-Universität, Deutschland

Past research has shown that 3-year-old children have descriptive and normative expectations about equal resource distribution. But what is the motivational source of these early agent-independent normative expectations about fairness? We predicted that these expectations not only have a conventional dimension (e.g., social regularities), but also a moral dimension in that they are driven by an altruistic interest in, and sympathetic concern about, others' desires and welfare (Decety & Yoder, 2015; Schmidt & Sommerville, 2011). In three experiments, 3-year-olds ( $N=84$ ) were given a third-party fairness task and two prosocial tasks (costly sharing task, emotional sharing task). In Experiment 1, children protested against unequal (but not equal) allocations. In addition, children's tendency to intervene against unfairness was positively related to their emotional sharing (GLM,  $\chi^2(1)=6.46, p<.05$ ). In Experiment 2, children observed a distributor who followed or violated an authority's command to allocate resources unequally.

Again, children protested more against unequal versus equal allocations and we found a positive relation between children's protest behavior and emotional sharing (GLM,  $\chi^2(1)=6.99, p<.01$ ). In Experiment 3, we investigated whether children enforce fairness norms by altruistic punishment of unfair behavior. Here, we found a positive relation between children's costly punishment of third-party unfair behavior and their own costly sharing behavior (GLM,  $F(1)=5.22, p<.05$ ). In ongoing work, we ask about the developmental origins of this interrelation between morality and prosociality by investigating infants' prosocial behavior and their spontaneous reactions to moral transgressions using eye tracking methodology

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NOTIZEN:

### 3.3.4 Neuromodulation psychischer Prozesse [Hörsaal A4]

Martin Herrmann, Universitätsklinikum Würzburg  
Ann-Christine Ehlis, Universität Tübingen

In den letzten Jahren haben sich verschiedene Methoden der Neuromodulation entwickelt und in der biologischen und klinischen Psychologie als Forschungsinstrumente etabliert. Dabei können externe Stimulationsverfahren mittels magnetischer Pulse (repetitive transkranielle Magnetstimulation, -rTMS), Ultraschall oder Gleichstrom (transkranielle Gleichstromstimulation, tDCS) von Trainingsansätzen unterschieden werden, bei denen eine Modulation neuronaler Aktivität durch den Trainierenden selbst erzielt wird (Neurofeedback). In diesem Symposium beschäftigen sich die ersten beiden Vorträge zunächst mit tDCS, wobei Martin Herrmann eine Verbesserung der Furchtextinktion durch Stimulation des Präfrontalkortex zeigt, während Agnes Kroczek über Möglichkeiten der Optimierung klinischer Interventionen bei Expositionsbehandlungen im Suchtbereich berichtet. Im dritten Vortrag von Johannes Rodrigues wird eine Studie präsentiert, die mittels Ultraschall die Annäherungs- und Vermeidungstendenzen in virtueller Realität moduliert. Abschließend berichtet Ann-Christine Ehlis über den Ansatz der Neuromodulation mittels Neurofeedbacktraining, insbesondere unter Verwendung der Nahinfrarotspektroskopie (NIRS), und diskutiert zugrunde liegende neuronale Mechanismen und aktuelle methodische Entwicklungen. Die vier Vorträge geben einen Einblick in die Neuromodulation psychischer Prozesse mit unterschiedlichen methodischen Ansätzen und zeigen Chancen und Limitationen dieses innovativen Forschungsfeldes auf.

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NOTIZEN:

**Verbesserung der Furcht-Extinktion durch transkranielle Gleichstromstimulation (tDCS)**

Herrmann, Martin; Dittert, Natalie; Hüttner, Sandrina; Polak, Thomas

Universitätsklinikum Würzburg, Deutschland

Auch wenn die kognitive Verhaltenstherapie mit ihrem wesentlichem Element, der Exposition, derzeit die erfolgreichste evidenz-basierte psychologische Behandlungsmethode für Angststörungen darstellt (Bandelow, Lichte, Rudolf, Wiltink, & Beutel, 2015), weist eine nicht zu vernachlässigende Patientengruppe, bei denen die Behandlung nicht wirksam ist oder es im weiteren Verlauf zu einem Rezidiv kommt, auf Limitationen der Behandlungsmethode hin (Bruce et al., 2005; Scholten et al., 2013). Es bedarf somit der Entwicklung weiterer therapeutischer Interventionen, welche das Extinktionslernen im verhaltenstherapeutischen Setting verbessern können (Graham B. M., 2011; McNally, 2007). Eine Möglichkeit stellen non-invasive Gehirnstimulationsmethoden wie die transkraniale Gleichstromstimulation (tDCS) dar. In dieser Studie wurde daher die Hypothese überprüft, ob eine Stimulation des ventromedialen Präfrontalkortex (vmPFC) mittels tDCS die Extinktionsleistung verbessern kann. Hierzu erfolgte zunächst eine Furchtkonditionierung und anschließend, doppel-verblindet bei  $N = 84$  Probanden, entweder eine reale oder sham tDCS für 20 Minuten mit 1.5 mA. Die Hautleitfähigkeit während der Extinktion zeigt bei realer tDCS eine schnellere Abnahme der CS+/CS- Diskriminierung im Vergleich mit der sham tDCS Gruppe. Wir gehen daher davon aus, dass eine tDCS des vmPFC die Furcht-Extinktion positiv beeinflussen kann und somit als Unterstützung für Expositions-basierte Therapieverfahren dienen könnte.

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NOTIZEN:

## **Neuromodulation in der Psychotherapie: Ein Ausblick über Einsatzmöglichkeiten am Beispiel der tDCS-gestützten Exposition zur Rückfallprävention bei alkoholabhängigen Patienten**

Kroczek, Agnes; Fallgatter, Andreas; Ehlis, Ann-Christine

Universitätsklinikum Tübingen, Deutschland

Das Suchtgedächtnis wird durch Konditionierungsprozesse ausgebildet und äußert sich in einer automatisierten Reaktion, die als Reizreaktivität (cue-reactivity) bezeichnet wird. Diese automatisierte Reaktion wird durch suchtasoziierte Reize ausgelöst. Die Reizexposition ist eine therapeutische Intervention, um dieser Reizreaktivität entgegen zu wirken. Die Reizexposition wird zur Rückfallprophylaxe bei Abhängigkeitserkrankungen angewendet. Die Aktivierung des Suchtgedächtnisses, ohne die unmittelbare Verstärkung durch den Suchtstoff (Konsum), ermöglicht Extinktionslernen. Präfrontale inhibitorische Verbindungen zu subkortikalen Strukturen bilden die neurobiologische Grundlage für diese Extinktionsprozesse. Die aktuelle Befundlage zeigt, dass die Effizienz der Intervention in der Rückfallprävention moderat ist. Dementsprechend werden Ansätze diskutiert, die Effizienz der Expositionsbehandlung zu steigern. Die funktionelle Nahinfrarotspektroskopie (fNIRS) bietet dabei eine Methode mit hoher ökologischer Validität, die sich anbietet um hämodynamische Prozesse während der Exposition in vivo zu untersuchen. Die tDCS (transcranial direct current stimulation) bietet einen Ansatz um Lernprozesse, z.B. im Rahmen therapeutischer Interventionen, zu unterstützen.

Unter der Verwendung dieser Methodiken konnten wir bereits zeigen, dass eine aktive tDCS die Konnektivität zwischen PFC und dem OFC bei einmaliger Anwendung während der Reizexposition bei Rauchern erhöht. Die Implikation für die klinische Praxis zur Unterstützung von Psychotherapie wird kritisch diskutiert. Zusätzlich werden erste Ergebnisse einer laufenden Studie zur Untersuchung der tDCS Effekte auf die Reizexpositionstherapie zur Rückfallprävention bei alkoholabhängigen Patienten beschrieben.

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NOTIZEN:



### **That sounds great! Transkraniale Ultraschallstimulation führt zu Annäherungsverhalten in ambivalenten Situationen in einem virtuellen T-Labyrinth**

Rodrigues, Johannes<sup>1</sup>; Ziebell, Philipp<sup>1</sup>; Allen, John<sup>2</sup>; Hewig, Johannes<sup>1</sup>

<sup>1</sup>Julius-Maximilians Universität Würzburg, Deutschland; <sup>2</sup>University of Arizona, Tucson USA

Transkraniale Ultraschallstimulation (TUS) ist eine neuartige Technik der Neuromodulation, die seit Kurzem auch bei Menschen angewandt wird (z.B. Fini & Tyler, 2017). TUS bietet einige Vorteile gegenüber bisherigen Verfahren (tDCS, TMS) wie z.B. fokussierte Applikation, hohe räumliche Präzision (z.B. Tyler et al., 2008) sowie Vermeidung unangenehmer Nebeneffekte, wie z.B. Kopfschmerzen oder Kopfhautreizungen (Tyler, 2011).

Hameroff und Kollegen (2013), Sanguinetti und Kollegen (2014) sowie Reznik, Sanguinetti und Allen (2017) konnten für Schmerzpatienten, gesunde Probanden und Depressive feststellen, dass nach einer Stimulation durch das rechte trans-temporale Fenster mittels Ultraschall eine Verbesserung der Stimmung auftrat. Dieser Effekt verbunden mit der Lokation der Ultraschallapplikation lässt auf eine inhibitorische Wirkung im Sinne der Theorie der frontalen Asymmetrie von Davidson (1984) schließen, und somit auf eine Unterdrückung des Withdrawal Systems. TUS könnte somit auch eine Auswirkung auf Verhalten haben, besonders solange der positive Affekt auch als Hinweis für eine Verhaltensentscheidung in einer unklaren Situation dienen kann.

Diese Hypothese wurde in einem virtuellen T-Labyrinth getestet, in dem 18 Probanden virtuelle Bewegungen in verschiedenen Situationen (Positiv, Negativ, Konflikt, Ambivalenz/Ambiguität, Doppelpositiv) ausführen konnten. Dabei durchliefen die Probanden drei Ultraschallbedingungen (kein Ultraschall, Ultraschall, Sham-Stimulation) an verschiedenen Tagen. Die Probanden zeigten nach Ultraschallstimulation wie erwartet mehr Annäherungsverhalten in ambivalenten Situationen. Zudem wurden nach Ultraschallstimulation subjektiv weniger Konflikte erlebt.

Diese vorläufigen Befunde wecken die Hoffnung, dass TUS eine Möglichkeit zur Beeinflussung von Verhalten sein kann, die möglicherweise auch in weiterführenden Studien an Patienten eingesetzt werden könnte um Annäherungsverhalten zu begünstigen und Konfliktwahrnehmung zu senken, beispielsweise bei Angsterkrankungen oder affektiven Störungen

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NOTIZEN:

### **Nahinfrarotspektroskopie (NIRS) als neuartiges Neurofeedback-Tool – Klinische Anwendung und methodische Überlegungen**

Ehlis, Ann-Christine; Barth, Beatrix; Hudak, Justin; Storchak, Helena; Weber, Lydia; Kimmig, Ann-Christin Sophie.; Dresler, Thomas; Fallgatter, Andreas

Universität Tübingen, Klinik für Psychiatrie und Psychotherapie

In den letzten Jahrzehnten hat sich die funktionelle Nahinfrarotspektroskopie (NIRS) als neurowissenschaftliche Bildgebungsmethode im Bereich der psychologischen und neuropsychiatrischen Forschung etabliert. Neuerdings wird NIRS in Forschungsprojekten auch als Methode für Neurofeedbacktrainings eingesetzt, erste Arbeiten liegen bereits vor. Der Vortrag beschreibt die Entwicklung dieser neuartigen Neurofeedbackoption, insbesondere im Rahmen der komplementären Behandlung psychischer Störungen. Ergebnisse erster Pilotstudien bei gesunden Personen und Patienten mit ADHS werden vorgestellt; weiter werden neuartige Protokolle zur Behandlung von akustischen Halluzinationen und Angstsymptomen beschrieben. Ersten Ergebnissen nach stellt NIRS eine nützliche und kosteneffiziente Methode für die Durchführung von Neurofeedback dar, vor allem wenn Trainings mit multiplen Sitzungen oder in Kombination mit weiteren Methoden (z. B. virtuelle Realität) geplant sind. Ein wichtiger Aspekt ist die kritische Diskussion aktueller methodischer Entwicklungen, wobei unter anderem Fragen der allgemeinen Wirksamkeit und Spezifität von Neurofeedbacktrainings zu erörtern sind. Darüber hinaus sollten methodische Details bei der Implementierung entsprechender Protokolle genau beachtet werden und zukünftige Trainings neben der Regulation einzelner Hirnareale auch Konnektivitätsmaße berücksichtigen, um neuronale Netzwerke zu modulieren. Ein wesentliches Ziel zukünftiger Studien sollte außerdem sein, nicht nur die (klinischen) Effekte von (NIRS-basiertem) Neurofeedback zu betrachten, sondern bessere Erkenntnisse zu den zugrundeliegenden Mechanismen zu gewinnen, um langfristig maßgeschneiderte Interventionen zu ermöglichen.

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NOTIZEN:

### 3.3.5 Behavioral and neural effects of Oxytocin - the role of contextual and personal factors [Hörsaal A5]

Benjamin Becker, University of Electronic Science & Technology of China  
Christian Montag, Universität Ulm

The evolutionary highly conserved hypothalamic neuropeptide oxytocin - (OXT) regulates affiliative behavior and social cognition across species. A rapidly growing number of molecular genetic and OXT-administration studies have contributed to delineate the regulatory role of OXT on human behavior and promoted the increasing interest in the therapeutic application of OXT in mental disorders to alleviate social cognitive dysfunctions. However, whereas early findings in humans emphasized the prosocial effects of OXT it has become increasingly clear that the effects of OXT evolve in complex interaction with both, personal and contextual factors.

The proposed symposium aims at providing a comprehensive overview on recent progress in understanding OXT's complex modulatory influence on human social behavior and the underlying neural substrates. Particular emphasizes will be put on factors that critically moderate and/or mediate the specific effects, including sex, genetics, personality traits and sociality.

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NOTIZEN:

### **The social cognitive effects of oxytocin - sex matters**

Becker, Benjamin

University of Electronic Science & Technology of China, China, Volksrepublik

The evolutionary conserved hypothalamic neuropeptide oxytocin (OXT) plays a key role in social information processing and regulates social behavior across species. In line with animal models suggesting that OXT has evolved some sexually dimorphic roles in regulating social behavior, a growing number of human OXT-administration studies reports sex-dependent effects of OXT. The talk will present findings from our pharmaco-fMRI studies that specifically examined sex-dependent effects of intranasal OXT in different domains of social behavior, such as social evaluation and empathy. Based on these findings the current talk will delineate common and distinct effects of OXT on social behavior in men and women and will discuss the neural circuits that mediate the sex-dependent effects.

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NOTIZEN:

**Towards Psychoneuroinformatics: Investigating social media usage by means of neuroscientific methods including magnetic resonance imaging and molecular genetics of the oxytocin/prolactin system**

Montag, Christian<sup>1,2</sup>

<sup>1</sup>Universität Ulm, Ulm, Deutschland; <sup>2</sup>University of Electronic Science and Technology of China, Chengdu, China

With the advent of the smartphone scientists gained unprecedented access to observe and record human behavior in everyday life. One of the most important channels on smartphones represent without doubt social media platforms including Facebook, WhatsApp and WeChat. The latter is a messenger-application often used on mobile devices in Asian countries (currently about one billion users). The present talk provides an overview on empirical evidence from several studies combining neuroscientific data with recorded human-machine-interaction via smartphones to gain a better understanding of social media usage. In detail, it will be focussed on a study linking higher Facebook usage on smartphones to lower gray matter volumes of the nucleus accumbens. Moreover, first insights into the neuroscientific underpinnings of WeChat usage will be provided. In addition, preliminary data on a study investigating genetic variants of the oxytocin receptor/prolactin gene in the context of individual differences in human social behavior on smartphones will be presented. The findings from all these studies will be presented in the framework of a potential new discipline called *Psychoneuroinformatics*, where ultimately all digital traces from the interaction with the Internet of Things can be added as another data layer in the human neurosciences to better understand the Homo Digitalis.

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NOTIZEN:

**Sociality as moderator of anxiolytic oxytocin effects – translational implications for clinical studies**

Scheele, Dirk

Universität Bonn, Deutschland

There is accumulating evidence that the neuropeptide oxytocin (OXT) can produce both anxiolytic and anxiogenic effects depending on context variables. Previous social interaction experiences and the availability of social support have been identified as key factors determining the outcome of OXT administrations. In my talk, I will present findings of functional magnetic resonance imaging studies in which we probed OXT effects on visual, tactile and olfactory social signals. These sociality-dependent OXT effects could help to explain why previous clinical trials yielded heterogenous results. For instance, we found that the effectiveness of a prolonged OXT treatment as a preventive intervention after trauma exposure in an experimental trauma model is dependent upon trauma disclosure. Translational implications for future clinical studies will be discussed

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NOTIZEN:

### **Effects of oxytocin on the temporal dynamics of EEG resting networks and its moderation by anxiety-related traits**

Schiller, Bastian<sup>1</sup>; Koenig, Thomas<sup>2</sup>; Heinrichs, Markus<sup>1</sup>

<sup>1</sup>Department of Psychology, Laboratory for Biological and Personality Psychology, University of Freiburg, DE-79104, Freiburg, Germany; <sup>2</sup>Translational Research Center, University Hospital of Psychiatry, University of Bern, CH-3000, Bern, Switzerland

Oxytocin is a key modulator of human social interactions. Neuroimaging studies have illuminated its underlying effects on neural networks during both social tasks and task-free, resting state conditions. Here, we used a spatio-temporal EEG analysis that reveals rapid switching among four consistently identified resting networks. Given oxytocin's anxiolytic effects, it should reduce switching among networks, as indicated by their longer duration and lower frequency, particularly in people with high levels of anxiety-related traits. Eighty-six male participants received oxytocin or placebo intranasally. Forty minutes later, their resting EEG was recorded, with only the eyes-closed periods being analyzed. A clustering algorithm revealed the four resting networks in both treatment groups, explaining 80% of the variance in our data. As hypothesized, oxytocin increased the duration and decreased the frequency of resting networks. Specifically, it decreased the coverage (= duration · frequency) of a network previously associated with saliency processing in benefit of increased coverage of a network previously associated with cognitive control. These effects were more pronounced in individuals with high levels of anxiety-related traits (insecure attachment style, neuroticism, social anxiety). In sum, our study reveals oxytocin as a stabilizer of the temporal stream of neural processing, as it reduces rapid switching among resting networks. Specifically, it seems to decrease the time the salience network scans the environment for potentially threatening stimuli, thus enabling more control-related processing. Our findings suggest that the temporal characteristics of EEG resting networks represent biomarkers of oxytocin's anxiolytic effects potentially informing innovative psychobiological treatment strategies for anxiety-related disorders.

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NOTIZEN:

**Oxytocin's effects on self-serving lying: a genetic psycho-pharmacological study**

Sindermann, Cornelia<sup>1</sup>; Luo, Ruixue<sup>2</sup>; Becker, Benjamin<sup>2</sup>; Kendrick, Keith<sup>2</sup>; Montag, Christian<sup>1,2</sup>

<sup>1</sup>Ulm University, Deutschland; <sup>2</sup>University of Electronic Science & Technology of China, China, Volksrepublik

Self-serving lying is reported throughout human history to cause tremendous losses for the persons lied at. Moreover, self-serving lying has a significant impact on human social relations. Although of great importance, the biological basis of lying is only poorly understood and the often-coined “prosocial” neuropeptide oxytocin has only seldom been investigated in this context.

162 male Chinese participants underwent a randomized double-blind placebo-controlled between-subject oxytocin treatment study where also behaviour in the die-in-a-cup paradigm assessing self-serving lying was assessed. Additionally, all participants provided buccal cells for genotyping polymorphisms of the oxytocinergic and serotonergic system. Results show interactions between oxytocin receptor haplotypes comprising i) the SNPs rs237887-rs2268491-rs2254298 ( $\chi^2(5)=18.12$ ,  $p=.003$ ), ii) the SNPs rs53576-rs2268498 ( $\chi^2(5)=17.73$ ,  $p=.003$ ) and oxytocin/placebo treatment. Moreover, an interaction of a prominent polymorphism in the TPH2 (impacting serotonergic neurotransmission) gene and oxytocin/placebo treatment ( $\chi^2(5)=21.34$ ,  $p=.001$ ) on behaviour in the die-in-a-cup paradigm could be observed. In sum, the present results emphasize that i) oxytocin plays a pivotal role to understand the biology of self-serving lying and ii) oxytocin's effects on self-serving lying depend on the oxytocinergic and serotonergic genetic make up of a person.

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NOTIZEN:



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